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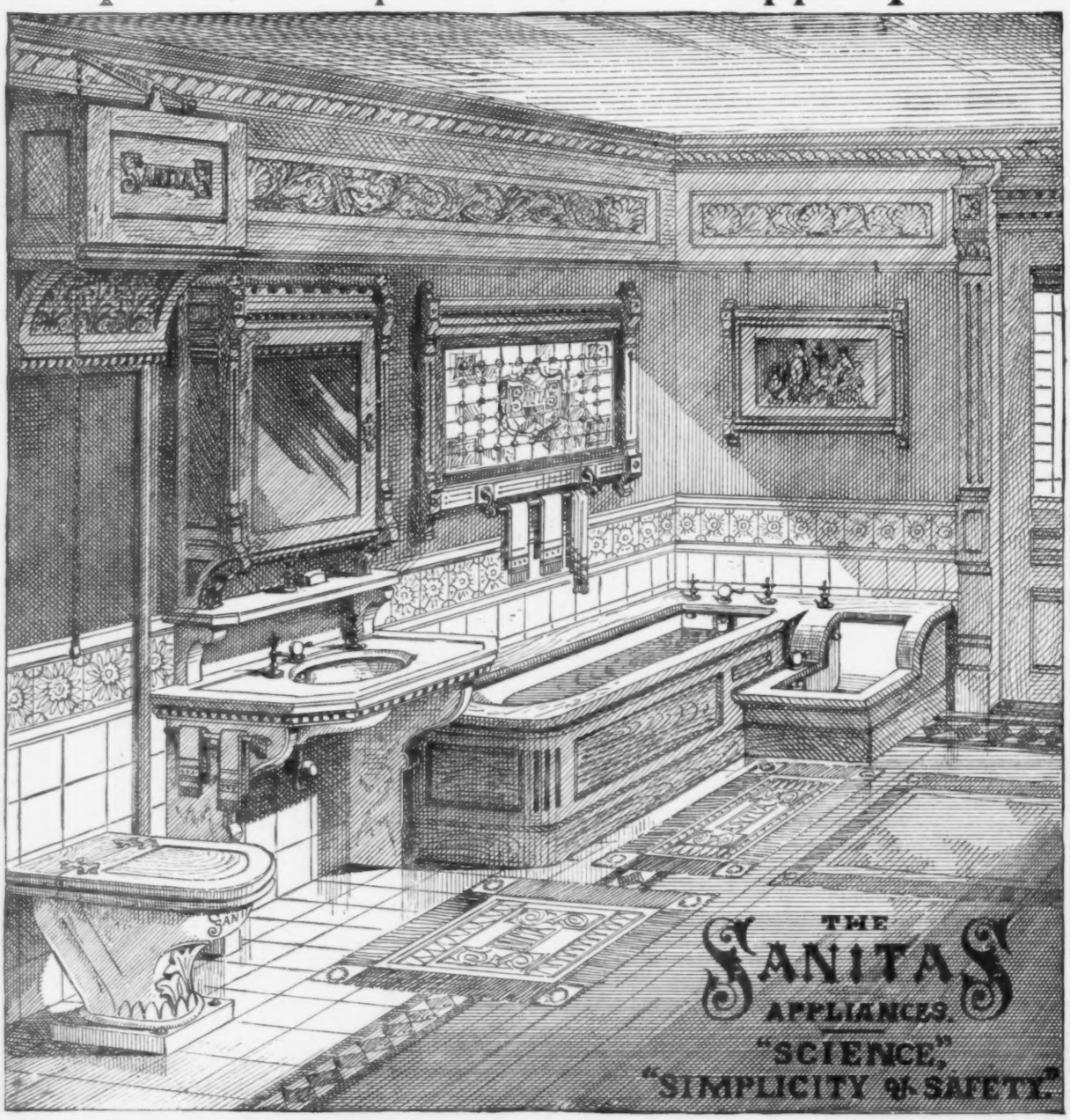
VIEW OF BATH-ROOM FITTED UP WITH THE

SANITAS PLUMBING APPLIANCES



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MR. HUBERT HERKOMER, now Professor in the University of Oxford, and the head of a very successful school of painting, is now building himself a wonderful house, which is described in the *British Architect* by Mr. E. C. Robins, who has recently visited it. Most of our readers know that the house was designed by the late H. H. Richardson, although Mr. Robins speaks of its author as simply "an American architect." The accounts of the way in which Professor Herkomer came to apply to Mr. Richardson for the design of the building vary. The English theory is, we believe, that the great artist, being on the most friendly terms with all the principal architects in his own country, felt that if he selected one of them to serve him professionally he would alienate the others; and, to avoid this misfortune, he concluded to offend all of them equally, but less seriously, by getting his architecture three thousand miles away. The American version of the story is that Mr. Herkomer appeared one day at Mr. Richardson's house and informed him that he had come to paint his portrait. Mr. Richardson, who knew the enormous prices paid for his visitor's work, protested that he had never thought of having his picture painted by so distinguished an artist, and that he could not possibly afford such a luxury. Mr. Herkomer answered that he had wished for some time to have a design for a house from Mr. Richardson, and had now come three thousand miles to get it, and wanted to paint Mr. Richardson's portrait to pay for it. This proposition simplified the matter, and terms were soon arranged, by which the Brookline architect took the plans, already laid out by the painter's talented wife, and worked them into available shape. The problem was one such as Mr. Richardson particularly delighted in — an irregular plan, composed of all sorts of studios, no two on the same level, with connecting corridors and galleries of various shapes and sizes, covered by high, simple roofs with huge dormers, giving his fancy ample room for the picturesque effect which he loved so passionately.

WHEN the working-drawings were done, and paid for by that striking portrait which we know so well, Mr. Herkomer carried them back to England and began putting them in execution, but with a variation, quite characteristic of so true an artist, from the ordinary methods. Instead of making a contract with a fashionable upholsterer for the finishing and decoration, with orders to have this room done in the Louis Seize style, the next in Moorish, and the connecting corridor in the Norwegian Romanesque, and to have the whole completely finished and delivered within three months from date of contract, he set himself at work to design panellings, carving, metal-work, coloring, hangings, and so on. A good artist is usually very much of an architect, just as a good architect is very much of an artist, and even the sober and thoroughly-trained Mr. Robins speaks continually, in describing his visit, of the "wonderful panelling," the "superb carving," the "glorious copper foliated railing," and the "inimitable" andirons and brackets which he saw, not only designed, but in many cases executed by the artist's own hand. More than this, whenever possible, Mr. Herkomer has endeavored to have the work that he could not do himself executed by his own relatives, many of whom are persons of great talent. An uncle in America is now weaving some of the silk draperies, another uncle and his father are to do carving for him, and the work that cannot be made a souvenir of some loved hand is to be executed in little workshops close by, under the eye of the master. Of course, finishing in this way takes time, and Mr. Herkomer intends to spend ten years over it, but when it is done it will not contain, if he can avoid it, a single inch of dull, meaningless, stupid detail, of laborious ugliness, or cheap sham. Whatever materials are used are of the best and most solid kind. The rooms are mostly panelled in oak, the cupboards in the drawing-room have doors with panels of pierced and repoussé soft steel, and copper, wrought-iron and stone take the place of the flimsy wooden baluster-work which we use so freely. What with the material, the design, and the method of execution, Professor Herkomer's house is certainly one of the remarkable of modern times. It is said that the inexhaustible beauty of detail of the old German churches suggested to him his plan for making his house a sort of museum of artistic workmanship, but, much as we may delight in the productions of Adam Krafft or his friend, we must acknowledge that the nineteenth century furnishes us with greater resources of material than they had, and under such a master as Herkomer, the realization of his scheme might well mark an era in art.

LA REVUE INDUSTRIELLE, which shows a singular judgment in its selection of new inventions for description, gives an account of two, which, as it seems to us, are likely to become more familiar some time. One of these is a riveting-machine, for use either in the workshop or on the ground, which acts in a manner completely new, but presents, apparently, great economy, as well as facility of management. Most architects have seen the riveting of bridge and roof work, either by hand, with hammers and die, the process employing three and often four men, or by the hydraulic machine, a most effective instrument, but incapable of being moved very far from the stationary pump which supplies it. Unlike this tool, the new riveter, which should be known by the name of its makers, Varlet et Cie, can be carried to any point on a wheelbarrow, hung by a chain, or placed upon a rolling stand, in proper position for action, and at a moment's notice unhooked and carried off somewhere else. In substance, the Varlet riveter consists of two short levers, or jaws, the front end of each of which carries a die for forming a rivet-head, while the rear ends are connected by a toggle, or knee-joint. The fulcrums of the lever are about half way between the ends, and consist of pins passing through a strong casting. The back of this carries a large screw, which passes through a nut which forms the knee of the toggle-joint, and, continuing a little farther, ends in a wheel with handles, like a steering-wheel. By turning this wheel the nut is made to move forward or backward on the screw, bending or straightening the toggle-joint, and bringing the rear ends of the levers nearer together or farther apart, and correspondingly opening or shutting the jaws which form the front ends of the levers. From the well-known principles of the toggle-joint, it is evident that as the knee approaches a straight line an enormous pressure is exerted at the ends of the jaws, and it is calculated that a pressure of twenty pounds on the handles of the wheel will exert force enough for any sort of riveting. The whole affair, when used in the shop, is suspended from the roof-beams or travelling-carriages by a counter-balanced chain, so that it can be readily moved to any position, and the piece to be operated upon is set so that the rivets will be vertical when placed in the holes made for them. With hand-riveting this would be inconvenient, as the man who holds the stationary hammer against the head of the hot rivet would be compelled to stoop or lie under the piece; but with the new riveter many advantages are gained. The greatest of these is, perhaps, the opportunity which it affords for using short pieces of round iron in place of rivets with heads. The iron bar being first cut into the proper lengths, nothing is necessary but to heat these, and drop them into the holes as the machine advances. The lower jaw, as well as the upper, being formed with a die, the bar drops just

far enough to reach the bottom of the die, and is then, by the closing of the jaws, compressed equally at each end, the two heads being formed together, and the hot metal of the rivet being forced uniformly into the irregularities of the hole in which it is placed, so as to fill it completely. This, with punched rivet-holes, which are seldom perfectly true, is an important matter, as the rivet cannot then be bent or turned under any strain so as to force off the head. With long rivets put in by hand, the part which receives the hammering is generally expanded so as to fill the hole, but the portion next the head is not much affected, and often remains loose; so that the bar with both heads formed at once gives not only a cheaper but a better rivet than the ordinary kind. Where a long row of rivets is to be driven, a small carriage may be adjusted to run over it, carrying the riveter, so as to secure the greatest speed for the work; and a small hydraulic press, connected with a pump by a hose, is then used instead of the screw for moving the toggle-joints.

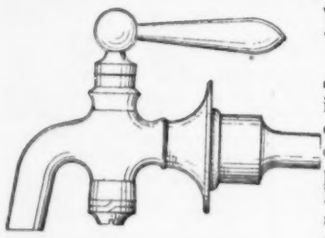
THE other invention is that of a new method for restoring the electric current in an arc-light. The greatest trouble in electric lighting of this kind has always been the difficulty of maintaining the arc. Notwithstanding the tremendous force of the current, it cannot jump through the air, even to a very small distance, and the only way in which the arc can usually be obtained is to bring the carbon poles in actual contact, and then, when the current is passing freely, separate them so as to display the dazzling arc formed by means of the electricity which then continues to pass across the interval. A slight obstacle to the current, or even a puff of wind, will often interrupt the arc, and it cannot be relighted in the air until the carbons are again brought in contact and separated as before. The various patents for arc-lights apply generally to details of different devices for producing this contact and subsequent separation of the carbons automatically, and the well-known flickering of arc-lights proceeds mostly from the automatic and instantaneous dropping of the upper carbon on the cessation of the current, and its retreat to its place as soon as it has touched the lower carbon and thus reëstablished the current. The abstraction of air from the space surrounding the carbons modifies greatly the behavior of the current. As soon as the resistance of the atmospheric non-conducting envelope is reduced beyond a certain point, the electricity, so to speak, bursts forth, and finds for itself a passage between the electrodes, and if anything near a vacuum is reached, the current pours freely between the electrodes, even though separated by several feet, filling the exhausted tube between them with a flame, usually of a blue or pink color, and far less brilliant than the ordinary electric arc in air. By gradually admitting air to the exhausted tube, however, the pale, diffused flame is reduced in dimensions and increased in brilliancy, until it reaches the usual form. M. Maneuvrier has taken advantage of this to arrange arc-lights in which the current passes between poles fixed in a glass globe hermetically sealed, except that a three-way cock serves to connect it with an air-pump or with the external atmosphere at pleasure. To light the lamp thus arranged, it is only necessary to connect the globe and the exhaust. As soon as the pressure of air in the globe is reduced to a certain point, the current begins to pass between the carbons in a bluish flame, and the atmosphere is then slowly admitted until the brilliant arc is produced. If the air is allowed to enter too rapidly, the arc is extinguished and the globe must be again exhausted, but with care the experiment may be successfully repeated as often as required.

THE *Builder*, which is becoming an authority on archæological matters, reviews a book by Professor Baldwin Brown, entitled, "*From Schola to Cathedral*," and intended to trace the development of Christian church architecture from a period anterior to that at which the increasing Christian congregations in Italy found it convenient to utilize for their services the disused basilicæ, or exchanges, of which there were many in the larger Roman towns. It would seem reasonable to suppose that there must have been some transition stage between the nocturnal assembling in the secret recesses of the Catacombs of such Christians as had escaped the wild beasts, and the regular celebration of their rites in the largest and most public of all Roman buildings, but very little has hitherto been ascertained in regard to this part of their history. No doubt for a time after the religion of the Christians had been licensed by imperial decree, the rooms of ordinary dwelling-houses were large enough for their meetings, but the increasing number of converts must have made it desirable to seek more spacious accommodations, and Professor Brown believes that these were first found in the *scholæ*, or club-rooms, which at that time abounded in Rome and the provincial cities. As in our day hundreds of lodge-rooms, club-rooms, directors'-rooms and similar apartments are found necessary for affairs of business and pleasure, so in Rome the managers of the games, the various boards of public works, the mercantile and manufacturing societies, and many other bodies had their regular meeting-rooms, larger and more conveniently arranged for their purposes than the rooms of a dwelling-house, but not to be compared in size with the basilicæ. The examples which have been discovered of rooms apparently intended for such purposes often have a semi-circular apse at one end, probably to give dignity to the place of the president of the club or the chairman of the board, just as our lodge-rooms are furnished with a sort of central throne for the chief dignitary of the order; and this, in accordance with the Roman habit of working out, once for all, a convenient plan, and adopting it everywhere, was, perhaps, the usual arrangement. Nothing could have been more suitable for a small Christian congregation, and, as the decline of the Western empire must have left many of these rooms vacant before the basilicæ were deserted, the theory that they were used for Christian worship before the new sect became numerous enough to need the larger buildings is a very probable one. As the plan of the apsidal ones was substantially the same as that of the basilicæ, no modification of the ritual beyond a change in its scale was necessary in making the transfer from the smaller to the larger edifice, and this may account for the absence of comment on the subject in the church histories. That the use of the *scholæ* for meetings of small congregations of some sort continued down to a late period is, moreover, indicated by the use of the Italian form "*scuola*," which is employed to this day in describing a club or small corporate body.

THERE seems to be what would be called here a "boom" in railroad building in Switzerland. Two of the recently projected roads are intended as branches of the line from Zurich to Innsbruck, which, since the completion of the Arlberg tunnel, has become one of the greatest through routes in Europe, connecting England and France directly with Vienna and the East. One of these, starting from Chur, which is already reached by a branch from the main line, and is the centre of several diligence routes, runs first to Thusis in the Grisons, which is well on the way to the Splugen Pass, and a connection with the Italian system of railways at Bellinzona; but instead of continuing in this direction, turns off up the Albula valley toward the Engadine, terminating for the present at Filisur. As the Engadine valley is visited by swarms of tourists every year, this part of the line is tolerably sure to be profitable, while the portion from Chur to Thusis will form, perhaps, the starting point for another international line. From Landquart, another station on the Chur railway, a narrow-gauge road is to be built to Davos, a dark, cold valley much frequented by invalids on account of its pure air. Still another narrow-gauge line is projected from Altstätten, on the Swiss-Austrian main line, to Appenzell, following the present diligence route; while in another part of Switzerland a similar road is to connect with the present railroad which runs through Interlaken, running from Interlaken to the familiar point of Zweilütschinen, and there dividing, one branch going to Grindelwald, and the other to Lauterbrunnen; and a fourth is to be built in the suburbs of Geneva. Not content with these, most of which must depend for business entirely upon the patronage of summer tourists, two roads with toothed rails, like the Rigi railway and our own Mount Washington railroad, are projected; one from Interlaken to the Schynige Platte, a favorite point of view near by, at an elevation somewhat greater than either the top of the Rigi or of Mount Washington; and the other from Lugano to the top of a neighboring mountain, not very high, but with a beautiful prospect. Notwithstanding the difficulties of construction of the Swiss roads, most of them must be very profitable. Interlaken alone is said to have, on an average, a hundred and twenty-five thousand visitors every summer; and the projectors of the railway to the Schynige Platte think that they are sure of the fifty thousand passengers necessary to enable them to pay adequate dividends to the stockholders.

THE WATER-SUPPLY OF BUILDINGS.[1] — V.

SUPPLY-FAUCETS.



THE special devices or apparatus governing the supply of water throughout the house may be divided into four classes; first, faucets or the appliances placed directly at the ends of the pipes for the direct supply of lavatories; second, valves and siphons for the supply of water-closets, either directly or through cisterns; third, ball-cocks for the supply of tanks and cisterns, and fourth, stop-cocks or stop-valves placed in the line of piping to regulate the flow of water through the pipe.

Each of these classes may again be subdivided into two kinds, namely: "ground" and "compression." In the former all parts are made of metal, and the operation is independent of soft washers or packing. In the latter some form of compressible washer is required as a necessary part of the construction.

With ground-cocks a tapering plug or key of metal is fitted and ground into the casting forming the water-way, the plug being perforated with a hole as nearly as possible equal to the size of the bore of the pipe, in such a manner that if turned so that this opening is in line with the opening in the body-casting it opens a passage for the water, while if turned at right angles to the previous direction it shuts off the flow. At any intermediate position the flow is partially obstructed. The plug is made tapering so as to allow for tightening up by means of a strong spring at its small end. The close fit of the ground surfaces is intended to prevent leakage so that no packing is required around the handle-rod. But the ground surface is liable to be scratched and to cause a leak in usage.

With compression-cocks a straight plug is used, without perforation, and its operating surface is at its end rather than on its side. This end is armed with a soft washer of leather, rubber, or some suitable compressible composition, and is brought down upon the water porte of the body of the cock by means of a screw, lever, or spring to shut off the water, or it is raised more or less from this porte or seat to allow water to flow more or less freely. With ordinary compression-cocks a packing is generally used around the handle-rod, but the packing as well as the washer is liable to allow leakage after short usage and requires occasional repair. Moreover, when the compression is effected by means of a screw, as is usual, the threading wears out more or less rapidly according to the nature of the strain to which it is subjected.

Ground-cocks are particularly objectionable in places where the water is apt to contain much grit or mineral sediment in suspension, for in this case small particles of the gritty substances will get caught between the ground surfaces of the brass-work and cut them. If the cock is in a position where it has constant use in such water, it will very soon wear out, and when worn, repair is very difficult and expensive to make, so much so that it is usually found better to replace a dripping faucet by a new one. Ground-plugs are not so objectionable from the standpoint of wear in the case of "stop" or "shut-off" cocks, for the control of the flow of water through the main pipes, because they are not so often turned, but if used in these places they should be so constructed as to enable the water to run through them in a full stream. The so-called "round-way" stop-cocks permit of this and thus effect a much freer discharge from a line of pipe than where ordinary stop-cocks are used.

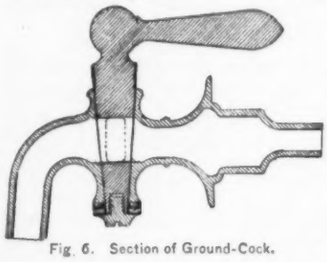


Fig. 6. Section of Ground-Cock.

There is, however, another and equally important objection to the use of ground-cocks which is independent of the quality of the water. Their sudden opening and shutting occasions a dangerous "water-hammer," which causes a shock to the pipes sufficient sometimes to burst them, especially after they have been weakened by use for some time. Accordingly it is a safe rule not to use "ground" faucets in places where the water pressure is likely to be great or varying.

Referring to these difficulties Mr. Gerhard writes in his "*Domestic Sanitary Appliances*," in the "compression" work both objections are successfully overcome. The flow of water is *gradually* cut off, and when finally checked does not cause any severe water-hammer or strain, hence such faucets are much more generally used. In case they become leaky it is owing to the wearing out of the leather washer, and this is easily replaced without requiring any great skill. A word of warning with regard to compression-work may not seem out of place. Whenever such bibbs commence to leak, avoid checking the leak by screwing the piston down too tight. This causes the quick wearing out of the screw-threads, and if once the latter become damaged, the faucet becomes worthless. The proper remedy is to at once replace a defective washer by a fresh one.

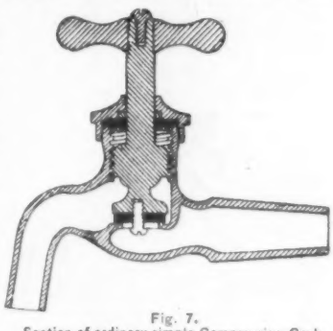


Fig. 7.
Section of ordinary simple Compression-Cock.

The initial cut represents an ordinary plain ground-cock or bibb with flange and thimble for connection with the supply-pipe. Fig. 6 shows the same in section explaining the construction. The ground plug is held tight against its seat by means of the spiral spring shown at the bottom. Fig. 7 shows the ordinary form of compression or screw-down cock. The water is shut off by the slow closing of a piston armed with a leather or rubber washer against a metallic seat. Any grit or sediment which might get caught between this valve and its seat cannot injure the metallic parts of the faucet. They simply impress themselves into the leather washer, which can easily be renewed in a few minutes, when worn away, as it will be in the course of time, by any person with common tools. The illustration shows the simplest form of compression-faucet made. The piston holding the washer is threaded and revolves the washer as it is screwed down. An objection to this simple action is the abrasion of the washer as it revolves in closing against its seat. To avoid this grinding of the washer, faucets are now made with pistons which do not revolve as they close. Fig. 8 represents one of the best examples of this form of faucet. The washer is held by a square piston which slides perpendicularly in a square groove. The screw which produces this motion is revolved by the handle of the faucet and works loosely in a female thread cut on the inside of the square piston, causing the latter to rise and fall instead of the screw and handle themselves, as in the simpler form. Thus the wear is taken off of the washer, and transferred to the metallic threading.

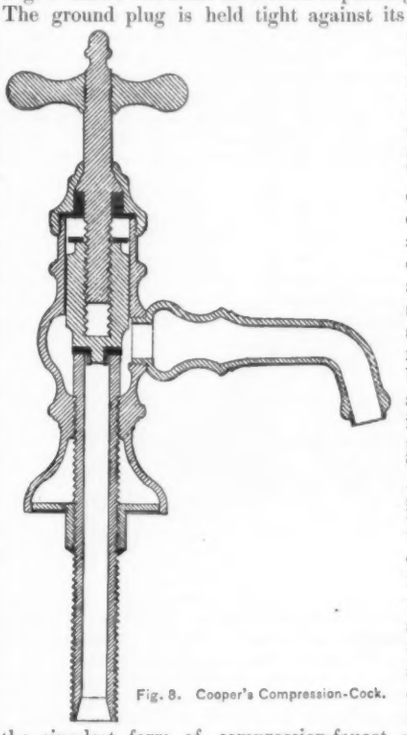


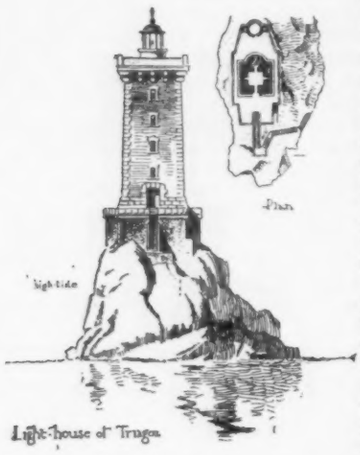
Fig. 8. Cooper's Compression-Cock.

[1] Continued from page 184, number 590.

ADDITIONS TO CARDIFF CASTLE. — Lord Bute proposes to spend £50,000 in making extensive additions to Cardiff Castle. The work is to occupy four years, and about 200 men will be constantly employed. Lord Bute has already expended an immense amount of money on the castle. — *London Truth.*

ANCIENT AND MODERN LIGHT-HOUSES.[1] — XIII.

LIGHT-HOUSE OF TRIAGOZ.



THE light-house of Triagoz in the Department of Côtes du Nord, France, is also established on an isolated rock in the sea called Guen Bras. The plateau of Triagoz is of considerable extent, being about four miles long from east to west by about one mile wide, but only isolated points of rock are exposed even in the lowest tides. The rock selected as the site of this light-house is the most elevated point on the south side, and, in consequence, marks the northerly limit of the channel followed by coasting-vessels. In front it has the appearance of an almost vertical wall, and on the opposite side it falls off with a depression in the surface forming a small open creek. This is the most accessible place during the three or four hours of low tide. The depth of water, which is over sixty feet at the lowest tides at the foot of the rock on the south side, increases rapidly as you leave it; the bottom is rocky, and the tidal currents so strong that the plan originally intended of keeping a vessel anchored here during the fine season to serve as quarters for the workmen, had to be abandoned. It was, therefore, necessary to build a hut, after having levelled off the summit of the rock, on the part corresponding to the interior opening of the tower. It enclosed a vertical post set in the centre of the structure, rigged with a boom for raising stones up to the work. The landing of the material was done by means of two derricks, one placed at the entrance of the little creek before mentioned, the other on the south-east end of the

rock. They were worked with great rapidity whenever the sea was smooth enough for landings to be made. The sketch gives a view of the work when the construction had been well advanced.

The base of the tower was fixed above the level of the highest tide; the edifice consists of a square tower with a salient staircase enclosure on one of its sides. On the level of the first floor is a vestibule leading to the staircase with a store-room on each side of it. There are three rooms above the ground floor, one of which is reserved for the engineers. They are roofed over with cloistered arches and are provided with fireplaces. In the upper part of the tower is the watch-room which serves at the same time as a store-room for implements that are to be kept free from moisture. The cast-iron stairway to the lantern leads from this room. A platform conforming to the shape of the rock surrounds the edifice; it is reached by means of flights of stairs, which are built into the side of the rock, starting from the point where the landing is least difficult. Under the front part of the platform are store-rooms for fuel and other materials.

The work was executed in rubble masonry with cut-granite trimmings; the outside faces of these stones were dressed to give an appearance of rustic masonry. The work was commenced in 1861 and finished in 1864; it cost about $60,000. The tower is ninety-two feet high, the light is ninety-eight feet above high water, is of the third order, fixed, varied by red flashes, and is visible twelve miles.

THE SMALLS LIGHT-HOUSE.

Although it is not necessary to give further details of the methods employed in building sea-rock light-houses, yet before leaving this part of the subject it is proper to make reference to some incidents connected with the erection of the Smalls Light-house off the west coast of Wales. The motive which influenced Mr. Philipps, its constructor, was of a more elevated character than that of other light-house builders of his time. In lighting these dangerous rocks he proposed, above all, "to serve and save humanity." Sixty years later, when the heirs of this philanthropist ceded the structure to the Trinity House, they were awarded an indemnity of upwards of $850,000.

The task undertaken by Philipps was sufficiently unpromising. The rock selected for the site projects in ordinary weather twelve feet above the sea, but in rough weather, which is frequent in this vicinity, the rock is entirely submerged. At the time this work was undertaken, engineers were not so numerous as now, and Philipps had difficulty in finding a suitable superintendent; he did find one, however, in the person of a young man named Whiteside, a musical-instrument maker, of Liverpool, with a remarkable genius for mechanics.

In the summer of 1772 Whiteside first made the acquaintance of the place on which he was to indelibly grave his name. He disembarked on the rocks with a gang of Cornish miners, and the obstacles which they met at the commencement of the work nearly disgusted him with the enterprise. He and his companions had started the work when a storm suddenly broke upon them. The wind blew with fury, and the cutter which had brought them had to fly before the fury of the gale. The workmen left on the rock hung on the best they could for two days and nights. Whiteside, however, was not discouraged, and finally brought the work to a successful end, but not without being exposed to many dangers.

One day the dwellers on the coast picked up on the beach a "message from the deep," that is to say, a cask inscribed "Open this and you will find a letter;" inside was a carefully-sealed bottle and in the bottle a document as follows:

"Smalls, February 1, 1777.

"*Sir*, — Finding ourselves at this moment in the most critical and dangerous condition, we hope that Providence will guide this letter to you, and that you will come immediately to our succor. Send to seek for us before spring or we will perish, I fear; our supply of wood and water is almost exhausted, and our house is in the most sad state. We do not doubt that you would come to seek us as promptly as possible. We can be reached at high tide in almost any weather. I have no need to tell you more, you will comprehend our distress, and I remain, Your humble servant,

"H. Whiteside."

Below this signature were these words:

"We were surprised on the 23 January by a tempest; since that time we have not been able to light the temporary light for want of oil and candles. We fear we have been forgotten.

"Ed. Edwards, G. Adams, J. Price.

"P. S. We do not doubt that the person in whose hands this will fall will be sufficiently charitable to send it to Th. Williams, Esq., Trelethen, near St. Davids, Wales."

The history of Smalls has other and darker pages. It is related that at the beginning of this century there was a winter so stormy that for four months the two keepers were entirely cut off from any succor from shore. It was in vain that vessels were sent to the rock, the furious sea always prevented a landing. One of them returned one day with a strange report. Its crew had seen a man, standing and motionless, in a corner of the exterior gallery. Near him floated a signal of distress. But was he alive or dead? No one could say. Each evening anxious looks were cast at the light-house to see if its light would be shown, and each evening it shone brightly, proof that some one was still there. But were both keepers alive, and if there were but one, who was the survivor? This was learned later.

One evening a fisher from Milford who had succeeded in landing at Smalls in an intermission of calm weather, brought to Solway the two keepers, but one of them was a corpse. The survivor had made a coffin for his dead comrade, then, after having carried it to a corner of the gallery, he had stood it on end, attaching it firmly. Left alone he had done good service. When returned on shore he was so changed, so emaciated, that his relatives and friends could scarcely recognize him. He asserted that his comrade died of disease; he was believed, but after this time there were always three keepers at Smalls in place of two — a wise precaution which has since been taken for light-houses placed in similar conditions.

[1] Continued from page 232, No. 594.

LIGHT-HOUSES ON THE ATLANTIC COAST OF THE UNITED STATES.

Our Atlantic coast does not afford any examples of rocks as high as Tillamook, but there are many outlying dangers which had to be marked by powerful lights exhibited from tall towers.

At Petit Manan, for example, off the coast of Maine, is a tall granite tower carrying a first-order flashing-light at a height of one hundred and twenty-five feet above sea level, which can readily be seen at a distance of seventeen nautical miles. Clustered around the base of the tower are dwellings for the keepers and an additional dwelling has been built one hundred and fifty feet to the westward. The keepers at this station have not only to attend to the light, but also to a steam-whistle which is sounded during foggy weather.

The next important light along this coast is on Mt. Desert Rock. This tower was built with a very broad base and thick walls; at

times the sea has washed entirely over the rock, and the keepers with their families have had to take refuge in the tower. The keepers succeed in raising a few flowers and fresh vegetables in earth brought by boat from the mainland and deposited in sheltered spots. The station is noted for the number of sea-birds, especially gulls, which lay their eggs there. The keepers never molest them.

Matinicus Rock is twenty-five miles out in the ocean from the mainland, directly in the pathway of the ocean-steamers plying from

Boston and Portland to Eastport, St. John, Yarmouth and Halifax, and of the immense fleet of coasting and fishing vessels trading between the United States and the British Provinces. This barren and jagged rock, covering an area of thirty-nine acres at low tide, is inaccessible except during favorable weather, and on it stand the two towers, dwellings and fog-signal which comprise the Matinicus-Rock Light-station. The station was first built in 1827 and consisted of a cobble-stone dwelling with a wooden tower at each end. In 1846 a new dwelling of granite with a granite tower at each end was substituted for the old dwelling which was used for an out-house, and the wooden towers were removed. Steam fog-signals were placed here in 1856, and in 1857 the granite towers of the dwelling were cut down to the roof and two isolated towers erected farther apart than the old ones.

In the spring of 1853, Samuel Burgess obtained the position of light-keeper; his family consisted of an invalid wife, four small daughters and a son, who, though making his home on the rock, was absent much of the time fishing in Bay Chaleur and elsewhere. The eldest daughter, Abbie, fourteen years old, was the keeper's only assistant; she aided in caring for the light as well as attending to the principal household duties. In the occasional absence of her father, the whole care of the lights devolved upon her. She modestly says: "I took a great deal of pride in my light-house work and tried to do my duty"—a duty on the faithful performance of which depended the safety of many a vessel and its crew. She soon became proficient, and, as subsequent events proved, was fully competent to assume full charge. On the morning of January 19, 1856, Abbie then being seventeen years of age, the Atlantic was visited by one of those terrific gales to which it is subject. This was the same gale that destroyed Minot's Light-house and its keepers. Her father was away, and the following letter written by her to a friend will show the dangers and responsibilities in which this brave girl was placed:

"*Dear* ——, You have often expressed a desire to view the sea out upon the ocean when it was angry. Had you been here on the 19 January, I surmise you would have been satisfied. Father was away. Early in the day, as the tide arose, the sea made a complete breach over the rock, washing every movable thing away, and of the old dwelling not one stone was left upon another. The new dwelling was flooded, and the windows had to be secured to prevent the violence of the spray from breaking them in. As the tide came, the sea rose higher and higher, till the only endurable places were the light-towers. If they stood we were saved, otherwise our fate was only too certain. But for some reason, I know not why, I had no misgivings, and went on with my work as usual. *For four weeks*, owing to rough weather, no landing could be effected on the rock. During this time we were without the assistance of any male member of our family. Though at times greatly exhausted with my labors, not once did the lights fail. Under God I was able to perform all my accustomed duties as well as my father's.

"You know the hens were our only companions. Becoming convinced, as the gale increased, that unless they were brought into the house they would be lost, I said to mother: 'I must try to save them.' She advised me not to attempt it. The thought, however, of parting with them without an effort was not to be endured, so seizing a basket, I ran out a few yards after the rollers had passed and the sea fell off a little, with the water knee deep, to the coop, and rescued all but one. It was the work of a moment, and I was back in the house with the door fastened, but I was none too quick, for at that instant my little sister, standing at the window, exclaimed: 'Oh, look! look there! the worst sea is coming.' That wave destroyed the old dwelling and swept the rock. I cannot think you would enjoy remaining here any great length of time for the sea is never still, and when agitated, its roar shuts out every other sound, even drowning our voices."

In the spring of 1857, Mr. Burgess left the rock to obtain his salary and secure needed provisions and fuel. The weather prevented his return, and the family ran short of food. Waiting till famine stared them in the face, the son started in a little skiff equipped with a sail, made by the aid of his sister, to obtain succor. Pushing from the rock in his frail craft, he was at first lost sight of in the trough of the sea, he reappeared on the top of the waves for a short distance and was seen no more for twenty-one days, during which time the mother and the four girls were reduced to a cup of corn-meal and one egg each per day. Added to risk of perishing of famine in mid ocean was the torturing suspense as to the fate of father and son. During all this time Abbie attended to the light, cared for her sick mother, and, by her spirit and example, cheered the little family clustered together on this wave-beaten rock in the Atlantic. Fortunately, father and son finally safely returned to their ocean home.

In 1861, Mr. Burgess was relieved of his duties by the appointment of Captain Grant and son. Abbie instructed them in their duties and in the same year married Mr. Isaac H. Grant, the son. The season of 1875 found her still on the rock, the mother of four children, and, a vacancy occurring at the White Head Light, Me., her husband was appointed keeper with her as assistant. They are still at this station, though it is her ambition to retire from the light-house service to a farm.

[To be continued.]

MAYALL'S PROCESS OF PHOTOGRAPHY IN COLOR.

THE following report, by Mr. Walenn, first published in *Invention* on the invention for producing photographs in color by Mr. J. J. E. Mayall, will be read with great interest by every one interested in photography:

According to request, I have examined Mr. John Jabez Edwin Mayall's patent specification, dated April 5, last. I have also had from Mr. Mayall himself certain illustrations and explanations of the process set forth in the specification above mentioned, and have arrived at the following conclusions:

The process is a continuous one for the production of permanent photographs — it is also a process of coloring the photograph by the use of chemical affinities having intimate relation to the action of the colors of the object photographed upon the photographic film.

In giving the theory or method of action of the process, in the

clearest terms, it is necessary to commence with the image first formed. This image is the one on the negative plate formed by actinic rays that emanate directly from the sitter. But the rays from the sitter convey more to the photographic film than the simple actinic or chemical rays, namely, the rays of white or combined light and the rays of colored or analysed light. The immediate suggestion is: Do the color-rays really affect the negative plate in a latent manner, so that they may be made manifest afterwards when a proper medium for their appearance, either selective or otherwise, is provided? To test this view it is necessary to compare it with the effects of each part of the process and with the result obtained.

The negative acts as its name implies in not doing what the positive does, or in doing it in the reverse way. The chemicals used are concerned simply in forming the image by the action upon them of combined light to produce form and gradations of the same neutral tint, according to the amount of photo-chemical action which takes place in the same duration of time on the various parts of the plate.

The colored rays that fall upon the negative have, nevertheless left an impression there, for they have different rates and qualities of vibration which the particles on the negative plate have felt the influence of; moreover, it is now known that they retain these rates of vibration and such other peculiarities of those vibrations as the chemicals used permit. Therefore, it remains to ascertain by a thorough analysis of the processes used in preparing the positive plate whether those vibrations of color, stopped off and stored up in the negative film, are allowed to become active on the positive film when the exposure again to light (under the negative) takes place. The principle here brought to bear upon the question is, that the negative and positive plates are registers of the vibrations which they respectively receive. If the above suggestion be the true one, this process is the nearest approach that has yet been made in photography to the practical realization and application of the relative color vibrations of light as determined by Dr. Young.

Prior to answering the question as to whether the process is such that the color rays from the sitter exercise a selective influence upon the ultimate color of the photograph in its various parts, color for color, it is well to remark that the inventor has put into practice certain broad principles, not rigidly observed before, but absolutely necessary to be adhered to if any approach to perfection be aimed at.

The manipulation commences quite anterior to that of other processes. Instead of accepting the paper, as furnished by the paper-makers, the inventor devotes his attention, at the various stages of the process, to perfecting the correctness of its surface; so that it may be perfectly plane. The value of this part of the general idea running through the whole process like a beautiful thread of exactitude is, that a truly flat surface is obtained to receive the image, by printing from the negative. In fact, the quality of the surface, as built up by the various processes, may be compared with that used in optics for reflecting or other purposes. This optical surface has another function, inasmuch as being mathematically correct, it limits the actions, catalytic in their character, which are in force to build up the colored image and causes them to be uniform in all parts of the photographic surface.

Another point that is steadily kept in view by this process is that the quality of the paper, or its initial covering of gelatine and albumen, is borne in mind, so that it may not be composed of a collection of fibres merely, but that, photographically speaking, it may be seen to be structureless, that is without granulation or fibre, even when submitted to the higher powers of the microscope.

The paper being thus built up with a view to its perfection of shape and quality, the requirements of after processes are kept in mind by the inventor from the beginning. In each process a basis is laid for some subsequent operation. Not only are the developing and fixing stages suitably provided for, but the balancing the chemical affinities from time to time and the operations necessary for the production of an ultimately unchangeable and permanent image are essentially attended to.

These points can be easily traced because of this continuity of design and purpose in the process as a whole, and because the inventor has had the courage, determination and ingenuity to begin at the very beginning, building up his excellent process step by step, and proceeding with magnificent march, gradually but perfectly to the end of his manipulations, till the final and truly artistic and scientific result is attained.

In sequence, the processes may be called: — 1, gelatinizing; 2, albumenizing; 3, sensitizing; 4, fixing; 5, coloring; 6, waxing; 7, setting the color; 8, glazing; 9, finishing.

In the first, or gelatinizing process, a basis is laid for subsequent development of the picture by the presence of lactate of iron; the film produced is oxidable, the iron waits for something to unite with it.

The second, or albumenizing solution, is still the more complex, and contains principles which aid the action of light upon the sensitizing salt afterwards to be applied. The interaction of the well-known substances, the glacial acetic acid (used to clear the albumen), chloride of sodium, and potassium bromide, is still kept in abeyance by the salicylic acid; the derivative of silex lays the basis of the vitreous coating afterwards to be given. The meconine (a derivative of opium which has special red coloration relations with iron) gives fair play to the formation of color and image, a peculiar bloom being thereby produced on the image. Owing to the organic radicles present, the condition of the chemicals already used is unstable; therefore the accomplishment of the following three things is rendered possible: — 1. A selective action by the vibrations or undulations of the light to which the plate is subsequently subjected; 2. The ultimate attainment of permanency; 3. The action, subsequently exercised, to fix the color when it is established and developed.

The third, or sensitizing process, provides for the diffusion of an exactly similar condition over the whole surface of the plate. The ammonia acts to equalize and absorb any of the unprecipitated parts induced by the action of the salicylic acid.

The use of weak sulphuric acid, after the fourth, or fixing operation, is a truly chemical improvement, as it provides more completely than has hitherto been done for the expulsion of the last traces of sodic hyposulphite. This part of the process also contracts the albumen and converts the argentic chloride into an oxide, which expands as the albumen contracts.

The fifth, or coloring operation, is peculiar to this photographic process, and provides a color basis from which the selection is made by the stored-up vibrations of light which the image has utilized, according to the color of the dress or appearance of the sitter. The colors dabbed on are reproduced in the photograph in the intensities and quantities of light and shade given by the negative plate.

The sixth, or waxing operation, stops the color from passing through the back of the picture; it also renders the paper impervious to moisture of any kind.

The setting of the color in the seventh operation, by means of salicylic-acid solution, brings into use its antiseptic qualities, and the other adjuncts assist in fixing the color and preventing its alteration by time.

The eighth, or soluble-glass process, is a fine and original method of effectually sealing the results of the previous work in a casing transparent and resistent to all atmospheric influences. The underneath silici surface may be said to be the plane of the picture, or the real pictorial surface.

The ninth, or finishing process, gives the plate a true, plane surface and provides for the permanence, protection, and unchangeability of the color, from the depth of tint of the final picture.

The colors applied are so attenuated and rendered so mobile during their application (as well as unchangeable in tint) that the greatest opportunity it given for the various interactions, actinic, photo-chromatic and selective, to assert themselves according to the original vibrations (color and otherwise), to which the sitter was subjected during the sitting.

The remarks to each process will enable the reader to observe that if the color influences, and other photographic influences, are capable of being selected, finited and fixed, they have all the necessary opportunities for accomplishing these important and novel results in the most perfect manner.

In the "*Text Book upon Photography*" published in 1878 by Longman and Company, and written by Capt. W. de Wiveleslie Abney, R.F., F.R.S., pp. 9 and 10, is an admirable exposition of the molecular action of the rays of light in travelling through the photographic film, in which he establishes the transferrence of energy throughout. In regard to the storing up of the energy, which is ordinarily called "absorption of light," he says: "Now, according to all ideas of conservation of energy, this absorption must indicate the performance of some kind of work. It may be that it causes the already-vibrating molecules to take up and swing in some complicated manner with those rays particularly absorbed, and thus to cause a rise in temperature in the body, so small indeed, perhaps, as to be undistinguishable owing to the rapid cooling, due to radiation; or it may be that work is performed in effecting chemical decomposition." It should also be noted that "where light is not entirely absorbed, but is only reduced in intensity, even then, also, work must be performed by it; for the intensity of any colored or white light is dependent on the extent or amplitude, as it is termed, of the wave or waves; and any diminution of the amplitude indicates that a portion of its available energy has been exhausted, and that, therefore, a transferrence of the portion so expended must have been made to the body through which it passed."

The subject-matter of this quotation immediately replies, in the strongest affirmative terms, to the question originally propounded, namely: "Do the color-rays really affect the negative plate in a latent manner, so that they may be made manifest afterwards when a proper medium for their appearance, either selective or otherwise, is provided?" Moreover, from the processes above analyzed, it also appears that the color-rays from the sitter exercise a selective influence upon the ultimate color of the photograph in its various parts. When light is made use of a second time in producing the picture, namely, in photo-printing the positive from the negative plate, it takes up the rates of vibration and the qualities of the vibrations of the negative in a complementary manner, and gives to the positive plate all the characteristics of molecular condition (including latent color vibrations), that it would have had if the positive had been taken at once, without the intervention of a negative, suitable chemicals being used.

The film of form, depth of tint, and color exists between two perfect films of glass, produced by the processes above detailed and annotated upon. This important part of the very fine and perfect results obtained has reference to the attainment of absolute permanency and comparative indestructibility in the finished picture.

The conclusion, therefore, at which I gladly arrive is that Mr. Mayall's process is the most perfect of its kind, both in regard to

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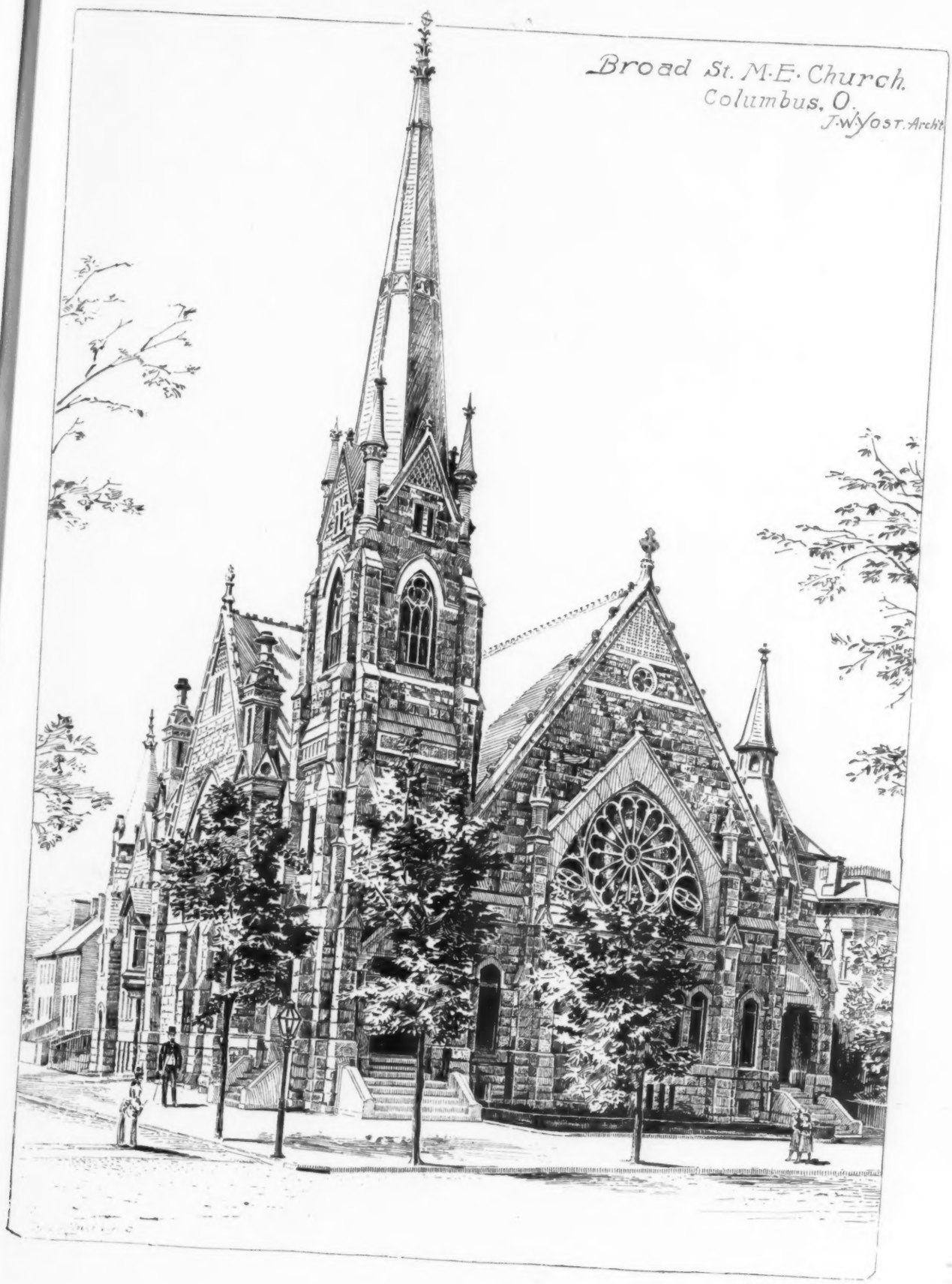

Heliotype Printing Co. Boston.

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House for Mr. H. C. Pierce: St. Louis, Mo.

Messrs. Fuller & Wheeler, Architects, Albany.

Heliotype Printing Co. Boston.

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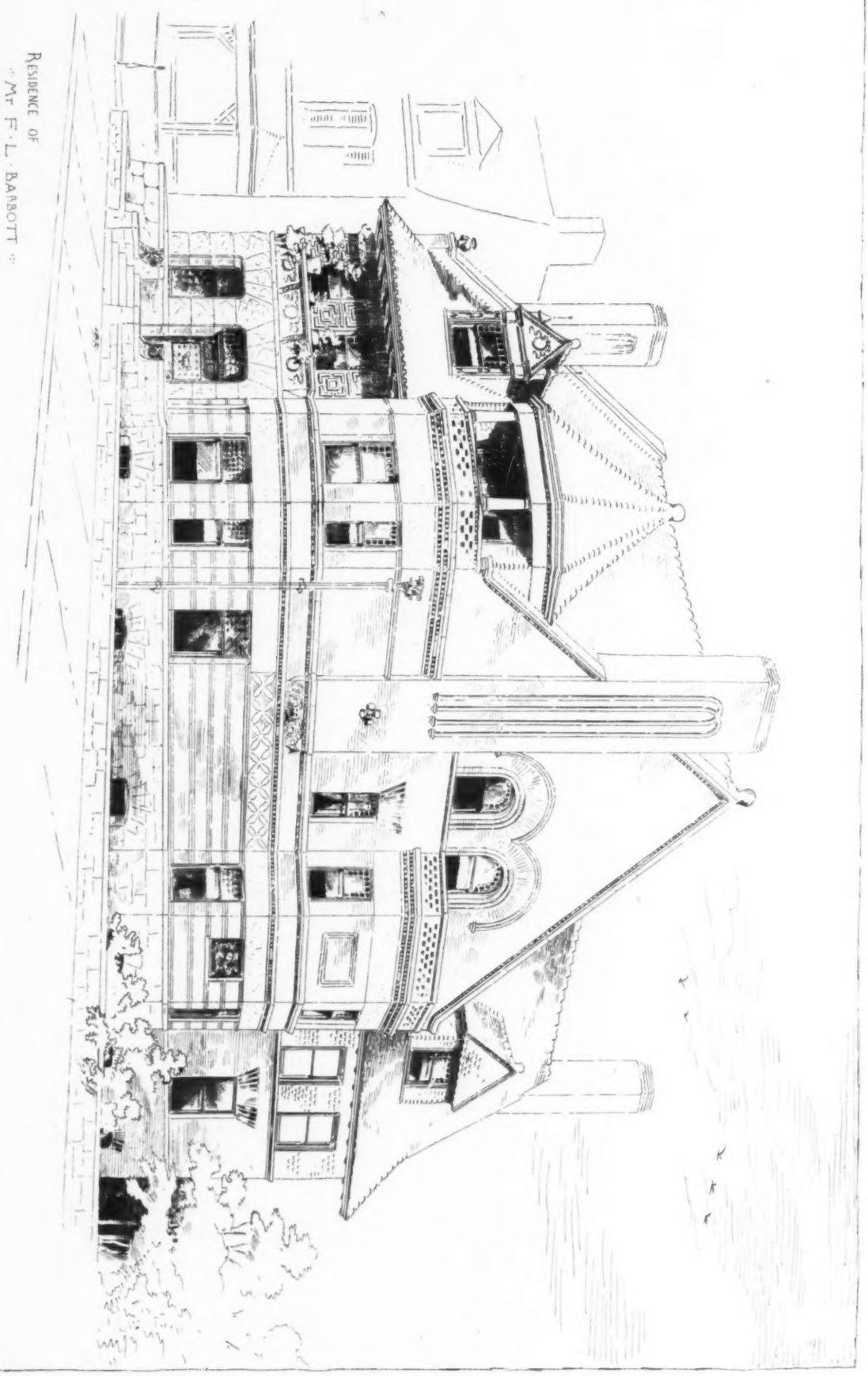

RESIDENCE OF
MR F. L. BABBOTT
LINCOLN PLACE BROOKLYN N.Y.
LAMB AND RICH ARCHITECTS

Heliotype Printing Co. Boston

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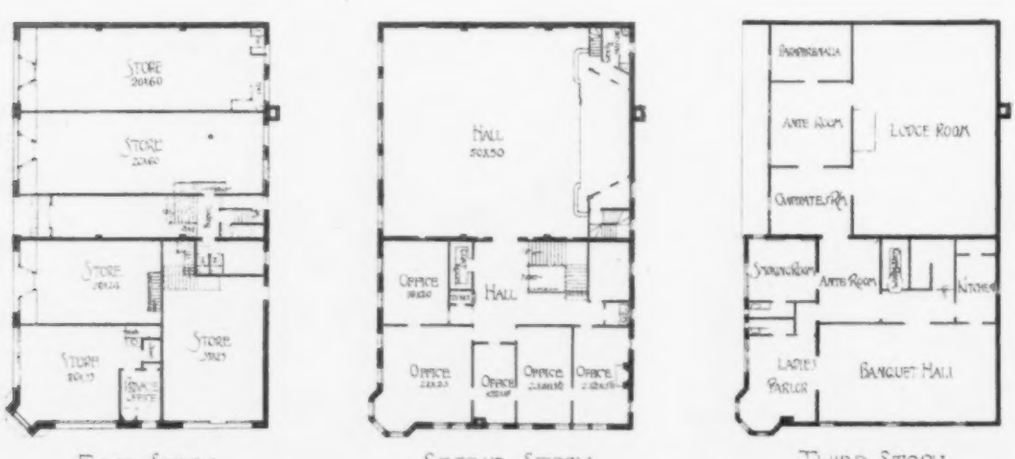
Building at Woburn, Mass. for Messrs. A.A. and E.A. Dow.

Andrews & Jaques, Archts Boston, Mass.



First Story Second Story Third Story

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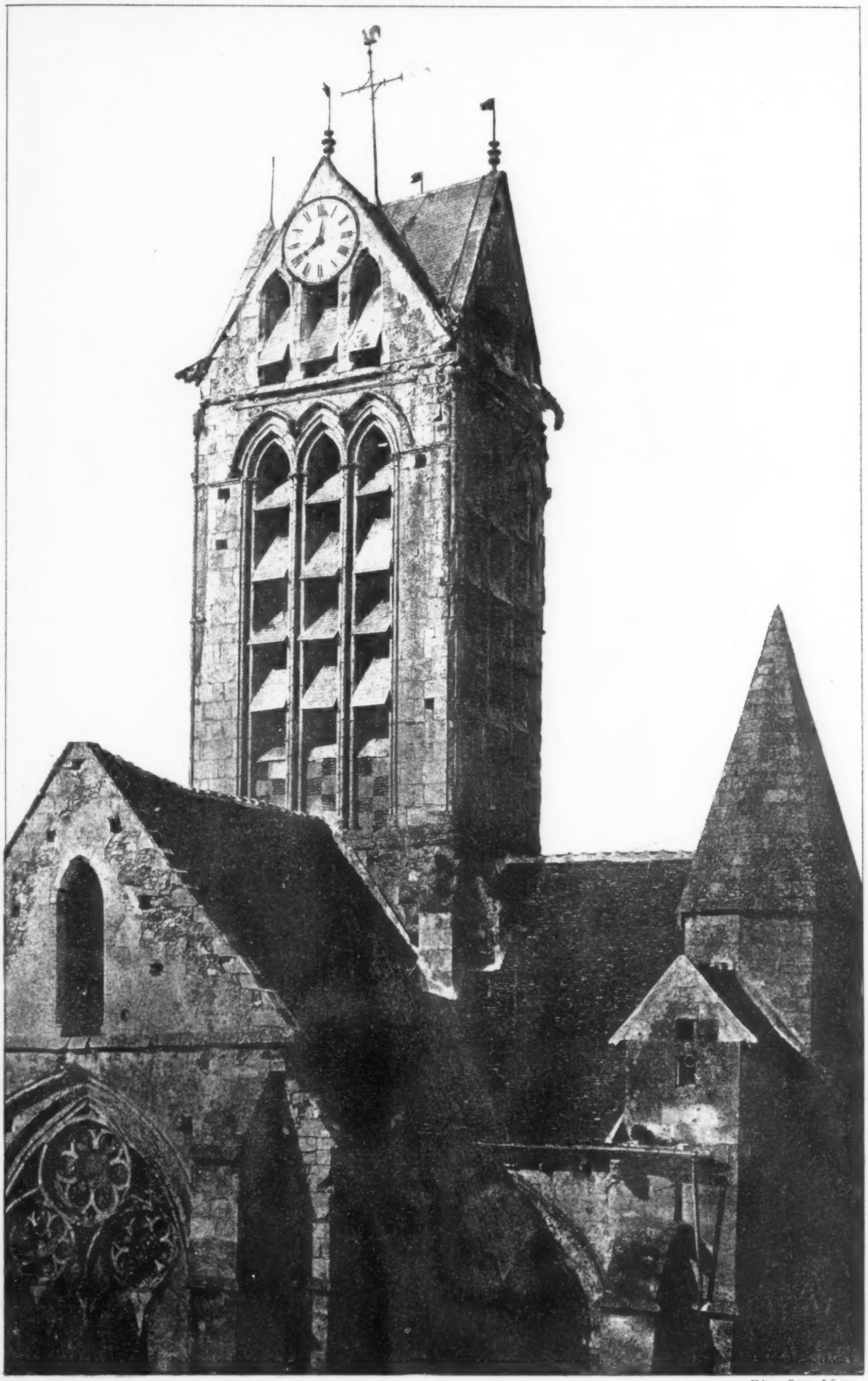

Heliotype Printing Co. Boston.

Church at Dormans, France.

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Sketches in Providence RI.

A typical Providence Residence of 50 or 60 yrs ago.

A couple of Residences with Stores under on South Main St: built about 50 years ago.

Yard and Stabling to the above.

Heliotype Printing Co. Boston.

its perfection of optical form, its selection of the precise color of the sitter, and its permanency.

W. H. WALENN, F.I.C., F.C.S.

ILLUSTRATIONS

[Contributors are requested to send with their drawings full and adequate descriptions of the buildings, including a statement of cost.]

CHRIST CHURCH, ANDOVER, MASS. MESSRS. HARTWELL & RICHARDSON, ARCHITECTS, BOSTON, MASS.

[Gelatine Print, issued only with the Imperial Edition.]

BROAD STREET M. E. CHURCH, COLUMBUS, O. MR. YOST, ARCHITECT, COLUMBUS, O.

THIS church was built a year ago at a cost of $67,000. It is of Pennsylvania greenstone, finished in oak and cherry; hard oil finish.

HOUSE FOR H. C. PIERCE, ESQ., ST. LOUIS, MO. MESSRS. FULLER & WHEELER, ARCHITECTS, ALBANY, N. Y.

HOUSE FOR F. L. BABBOTT, ESQ., BROOKLYN, N. Y. MESSRS. LAMB & RICH, ARCHITECTS.

BUILDING FOR MESSRS. A. A. & E. A. DOW, WOBURN, MASS. MESSRS. ANDREWS & JAQUES, ARCHITECTS, BOSTON, MASS.

SKETCHES AT PROVIDENCE, R. I.

CHURCH AT DORMANS, FRANCE.

THE LATE M. RUPRICH-ROBERT.

'The Chancery' Chamber
St John's Gate London Engd. date 1806.
used by the Order of St John of Jerusalem.

THE death has been announced of M. Ruprich-Robert, who held a distinguished place in the ranks of French architects. In *La Construction Moderne*, M. Maurice du Seigneur gives the following account of his life and works:

French art has sustained a great and veritable loss, for he who has just died was not only a master in the full sense of the word, but also one of those rare spirits who seem to be the guardians of the primitive forms of our national architecture, a scholar who was conscientious and precise, fascinated with the study of the past, and careful of the independence of artists in the future. Ruprich-Robert belonged to that valiant school who defended Mediævalism against the stupid attacks of routine and conventionalism. Like Viollet-le-Duc, he was one of the most vigilant and sagacious of the restorers of the monuments which were termed Gothic by the successors of the famous Petit Raidel, the imaginative architect who proposed to transform the pillars of churches of the fourteenth and fifteenth centuries into Doric columns resembling those of Pæstum. It must be said, however, that if Ruprich-Robert preferred Mediæval art, it would be unjust to fail in recognizing his respect for the works of antiquity, and for the works of a later time which were inspired by them. With so vast and honest an intelligence, he was perfectly able to comprehend the gracious adaptations of the Renaissance, as seen in the pomp of the seventeenth century and the caprice of the eighteenth. His protests and disdain were reserved for the immaturity and want of equilibrium of the present; his apprehensions, which were expressed with energy, were excited by the menacing apparition of that official art which is sure to lead to the panalities of academicism of the official sort. I have had the privilege of late to listen to the conversation of Ruprich-Robert, and amidst the terrible sufferings he endured from a disease for which there was no remedy, he was constantly preoccupied with the work of his life. He was anxious to see the failure of certain attempts at monopoly which were effected in the interests of men inspired by a narrow and unworthy ambition; he was eager to see a renewal of that spirit of freedom which is manifested in so many old cathedrals and manor-houses. His heart was full of warm emotions when he spoke on these subjects, although from his rigid and severe expression he might be thought imperturbable.

In appearance Ruprich-Robert resembled one of those respectable and austere figures of apostles that are seen under canopies in the doorways of churches, and as they seem to smile at the young birds who build amidst the sculpture of the tympanum, so he regarded with affection the students who were to be the architects of the future. His opposition on the subject of official diplomas must not be misunderstood. He was the first to recognize how much had to be gone through before gaining one of them, and also the talent and capacity of the competitors, but he feared that the diploma would lead to the supremacy of mediocrity in art, of which he was always an opponent.

Victor Marie Charles Ruprich-Robert was born in Paris on February 18, 1820. At sixteen he entered the *atelier* of Constant Dufeux, and during the five years he remained in the Ecole des Beaux-Arts was recognized as studious and capable. He became attached to the Commission of Historic Monuments in 1844, and exhibited for the first time in the *Salon*, the subject of his drawings being the Templar's Church at St. Gaudens, which dates from the twelfth century. They were for the Commission, and were followed by others which were also intended to be deposited among the archives. In the *Salon* of 1847 he exhibited drawings of St. Nicholas, Caen; in 1849 the church of St. Luke, Calvados, and the doorway of the church of Seez. He sent also a design for a sculptural monument. A second-class medal was awarded to him at the International Exhibition of 1855 for the drawings already mentioned, which were re-exhibited with others of St. Sauveur's, Dinan, and a project for the restoration of the Abbaye aux Dames, Caen. Afterwards he was appointed professor in the special school of design and mathematics in the Rue de l'Ecole de Médicine. There he delivered a remarkable course on the history and composition of ornament, in which he developed the principles of his well-known book, "*La Flore Ornamentale.*" The school, which had supplied French industry, and even contemporary architecture, with some useful men, gained one of its most firm and intelligent supporters in the new professor. The school is installed in its present position since 1776; the amphitheatre, formerly used for surgical operations, was built between 1691 and 1694 by the architect Charles Joubert. As the school which is familiarly known as La Petite Ecole adjoins the new Ecole de Médicine, a project for its proposed demolition, in order to allow more space for the new buildings, and to widen the very narrow street, has been long seriously considered. The removal of the school of design caused much concern to Ruprich-Robert. He was also actively engaged in the efforts to obtain the remains of the ancient church of St. Julien le Pauvre in the neighborhood as a substitute. The church itself could be transformed into a museum of decorative art, and a lecture-hall and new buildings could be added for class-rooms. The proposal would have the double advantage of rescuing an historic monument that is precious, and of utilizing it in a manner more worthy of its origin and character than by converting it into a museum of hygiene, which is the desire of the Municipal Council.

In the *Salon* of 1868 Ruprich-Robert exhibited drawings of the church of Flers (Orne), constructed by him between 1858 and 1864, and a design for a *couronne de lumière* for the abbey of Ensiblin. In the *Salon* of 1873 appeared his project for the restoration of the Château d'Amboise. The churches of Ouistreham and Bernières were also restored by him, and drawings were exhibited in 1878. For his drawings and designs in the International Exhibition of 1878 he obtained a first-class medal. In 1879 he exhibited several views of the church of Fresne Camilly, Calvados, and in 1870 no less than twelve important drawings of doorways and façades. Ruprich-Robert was a chevalier of the Legion of Honor since 1861, and in 1880 he was raised to the rank of officer. In 1878 he was appointed inspector-general of historic monuments.

He contributed at one time several articles to the *Revue de l'Architecture*, and was the author of a pamphlet entitled "*Le Premier Décorateur, c'est l'Architecte*," and of others on the churches of the Trinity and St. Stephen, Caen, the château of Falaise, and the church and monastery of Val de Grâce. The work which has made his name most prominent is the "*Flore Ornamentale*," a folio-volume with one hundred and fifty-two plates. He also wrote about the influence of public opinion on the conservation of ancient monuments, and about the "*Arènes de Lutèce.*" The most important of his books is known as "*L'Architecture Normande aux XI^e et XII^e Siècles en Normandie et en Angleterre.*" It is the result of thirty years of study and observation, and exhibits in a new light the success of the art on both sides of the Channel. It contains one hundred and seventy engraved plates, historic and descriptive letter-press illustrated by about two hundred designs. The last months of the life of M. Ruprich-Robert were employed on the completion of this work, which is a veritable historic monument. The foundation of it was laid as far back as 1857, when he began the collection of materials for the restoration of the celebrated Abbaye aux Dames at Caen. I have witnessed the marvellous energy and tenacious power with which he labored upon the book. In the intervals of his intense suffering he jealously scrutinized the engraving and the printing of the plates.

During his latter days he was surrounded with all the tenderness and affection that his family could bestow. It was in Cannes on May 7, at half-past six in the morning, that he expired. He left three sons, one of whom, M. Gabriel Ruprich-Robert, was the faithful and intelligent auxiliary of his father, and who will, no doubt, as an architect, uphold the credit of his name. His father's work and life may be summed up in two words, "Science and Conscience."

WOOD-DRYING EXPERIMENTS.

A very interesting series of experiments to determine the fluctuations of moisture in various woods during seasoning has lately been closed by the Chicago, Burlington and Quincy Railway at the Aurora shops. The experiments, says the *Railway Review* in a recent article, are being continued, but the first series ended in February, having been commenced December 21, 1885. The prime object of this work was to discover the laws of seasoning, if such laws existed, and thus to ascertain in what months the greatest amount of seasoning takes place, and whether wood thus seasoned reabsorbed moisture during the wet months of the fall and winter.

The work was undertaken in a very systematic way, and was done about in this wise: Three pieces of rough dressed oak, ash and Norway pine, thoroughly green, were piled loosely, with cleats between, with a board overtopping all, in a situation where they were protected against drip and direct rain, but where they were open to rain, snow and the sun on their sides. The conditions were, as nearly as possible, those to which lumber piled for out-door seasoning is usually subject. The dimensions of these pieces at the start were as follows:

Pine, cross-dimensions, 9½ x 5½ inches. Length, 14 feet 2 inches.
Oak, cross-dimensions, 8¾ x 5¼ inches. Length, 9 feet 6 inches.
Ash, cross-dimensions, 8¾ x 4¾ inches. Length, 7 feet 5 inches.

On each alternate week pieces of wood were sawed from these timbers. From the piece of pine 5¼ inches were sawed off the same end every time, and borings taken from the centre of the sawed-off block. From the ash 4 inches were sawed off for each of the first 11 tests, and 3 inches for each of the remaining 13 tests. From the oak 5 inches were sawed off for the first 11 tests, and 3 inches for the remaining 14 tests. The borings taken from these pieces were carefully weighed, then thoroughly dried out and again weighed, which process gave the percentage of moisture in each piece. The borings were always taken from the centre of the block. By arranging the results of each fortnightly test the following tabulation is made, showing the fluctuations of moisture during the whole period of one year, two months and one week. The exact percentages of moisture thus obtained are given in the following table:

Date.	Percentage of moisture.		
	Oak.	Ash.	Pine.
December 21, 1885	40.93	27.56	24.25
January 4, 1886	40.76	27.36	23.35
January 18, 1886	40.01	28.27	23.53
February 1, 1886	42.36	28.31	23.84
February 15, 1886	42.63	28.98	23.88
March 1, 1886	42.14	28.87	23.25
March 15, 1886	42.53	28.25	23.12
March 29, 1886	42.03	27.25	22.62
April 12, 1886	41.25	26.66	22.44
April 26, 1886	41.23	24.68	21.63
May 10, 1886	39.45	22.98	20.83
May 24, 1886	37.29	22.79	19.40
June 7, 1886	37.05	20.78	17.81
June 21, 1886	36.79	20.58	18.14
July 6, 1886	35.70	17.78	16.14
July 19, 1886	36.77	15.84	15.74
August 2, 1886	34.99	12.74	12.65
August 16, 1886	35.91	13.84	14.02
August 30, 1886	35.03	14.06	14.04
September 13, 1886	34.65	13.26	13.33
September 27, 1886	36.66	13.00	15.36
October 11, 1886	33.54	12.02	13.48
October 25, 1886	33.50	13.77	14.28
November 8, 1886	33.33	14.02	14.41
November 22, 1886	Stolen.	13.78	14.68
December 6, 1886			14.55
December 20, 1886			14.92
January 4, 1887			14.49
January 17, 1887			14.10
January 31, 1887			14.61
February 14, 1887			14.35
February 28, 1887			14.61

The above figures indicate that there was a slight increase in all three kinds of wood between January 4 and February 15. The seasoning — that is, the loss of moisture, began practically February 15, with all three woods, and ended August 2 with the ash and pine, but with the oak October 11 seems to have been the finish. The results with the oak were not altogether satisfactory to the experimenters. The present second series of experiments will, it is hoped, throw more light upon this kind of wood. From February 15 to August 2 the ash dropped from 29 to 12¼ per cent, a loss of 16¼ per cent. From August 2 to its finish, December 20, the fluctuations were between 12 and 14 per cent, the exact average being 13.27 per cent.

From February 15 to August 2 the pine dropped from 24 to 12½ per cent, a loss of 11½ per cent. From August 2 to its finish, February 28, its fluctuations were between 12½ to 15½ per cent. From October 25, 1886, to February 28, the exact extremes were 14.10 and 14.92 per cent, a difference of only 0.82 per cent. The extreme fortnightly fluctuation was 0.51 per cent. The average fluctuation was 0.30 per cent. The average moisture for that period was exactly 14.50 per cent. These experiments cannot be taken at present as supplying infallible data, but in a general way it may be said that they lead to the conclusion that as regards oak, ash and pine woods in a green condition, seasoning begins in very early spring (depending, of course, largely upon the kind of weather), and ends in midsummer. The provisional limits of this drying season may be fixed at the 1st of March to the 1st of August — in other words, including the months of March, April, May, June and July. It has also been shown that as regards ash and pine, after seasoning is effected, the wood will not take back water — that is, not beyond slight amounts during the wet and cold seasons. These conclusions are true only for the inmost parts of the woods in question and of the sizes experimented upon. Variation in the character of the wood, condition at the time of cutting down the tree, treatment between that time and the first time of testing, sizes of pieces, etc., may alter the conclusions, although probably they would not materially do so. The data which has been gathered in this way can be used to material advantage in many ways, notably, however, as an aid in the purchase of cars and in the purchase of timber. With the exact knowledge that it affords of the seasoning properties of different woods, and of the months during which the seasoning liable to be hastened or hindered, the guesswork of sellers of lumber and makers of cars can be readily checked.

THE RELATIVE ECONOMY OF ELEVATORS.

In most instances the conditions of the supply of motive power are such that it would be feasible to use any of several well-known types of elevators, but it is equally true that in many instances the selection is based upon superficial motives without due consideration of what constitutes the greatest economy of all the elements entering into the problem. In fact, there is but little data upon which such estimates can be accurately based. Mr. Edward E. Magovern, of the New York Steam Company, has given much attention to the matter, and his conclusions are based upon a systematic experience for five years upon upwards of six hundred elevators in actual use in the city of New York. The results are relative, being, of course, based upon the actual cost of plant, repairs, attendance, fuel, and water at the market rates prevailing in the locality under examination, but this does not impair the value of the results, as in case of differences the same methods can be applied to other markets. The results in each classification are based upon the relative values given to each element of cost, the allotment for motive power being, 100; the interest on initial cost, 33⅓; expense of repairs, 27½; cost of attendance, 95; so that the maximum value would be 255.83. The elevators are classified as to their motive power, whether derived from intermittent steam engine, continuous steam engine, hydraulic elevators operated by public water-supply, hydraulic elevators actuated by head of water supplied by an open tank on the roof kept full by local pumps; hydraulic elevators driven by the water-supply forced into closed tanks by local pumps, and belt elevators. The results are based upon conditions of uniformity of load and trips per day in order to be strictly comparable with each other. Arranging his conclusions in tabular form, varying slightly from his method of presentation, they are as follows:

Motive Power.	Cost of Motive Power.	Interest on Initial Cost.	Cost of Repairs.	Cost of attendance.	Totals.
Belt elevators	12.00	5.00	24.75	9.50	51.25
Public water-supply	8.00	16.67	5.5	47.50	77.67
Continuous steam engine	40.00	15.00	27.50	28.50	110.00
Open tank	18.00	30.00	11.00	71.25	130.25
Intermittent steam engine	60.00	28.33	16.50	80.75	185.58
Closed tank	100.00	33.33	13.75	95.00	242.08

The following table shows in the last column the total economy of each type of elevator under the conditions of those under examination, out of a maxi num cost represented by 255.83. Reduced to percentages of that number, the relative cost would be

Belt elevators	.2005
Public water-supply	.3037
Continuous steam engine	.4300
Open tank	.5091
Intermittent steam engine	.7254
Closed tank	.9463

The relative cost of each motive power, interest, repairs, and attendance for each type is shown by the following table:

Motive Power.	Allotment of Values.			
	100	33⅓	27½	95
	Cost of Motive Power.	Interest on Initial Cost.	Cost of Repairs.	Cost of Attendance.
Belt elevator	12	15	90	10
Public water-supply	8	50	20	50
Continuous steam engine	40	45	100	30
Open tank	18	90	40	75
Intermittent steam engine	60	85	60	85
Closed tank	100	100	50	100

It will be noticed that no consideration is given to the cost of elevators operated by hydraulic water-supply at great pressure furnished for power purposes from mains and plant owned by a company, or by compressed air furnished in like manner, as neither of those methods of distribution of power are used in any American city. Nor is any reference made to electric motors used for elevators, although there are a number of such elevators used in Boston and New York and in smaller numbers elsewhere, generally in connection with the leads from an electric-lighting station furnishing electricity for incandescent lights. Power furnished in that manner would in general exceed that derived from any of the sources mentioned in the table, although their use is well fitted to many places where the above methods are not convenient of application. It is not to the credit of the engineering skill of those engaged in the exploitation of electric motors that in many instances their application to elevators is made by using the motor to drive a pump which forces water into either an elevated or a closed tank, increasing the number of conversions of energy and the losses attendant thereon in an unnecessary measure. They should rather apply their skill to the production of electro-motors which would operate with the needful smoothness, and also be subject to the small range of motions and ready control by the operator as is requisite in all elevators.—*Iron Age.*

BOOKS AND PAPERS.

MR. GERHARD has given us what might properly be called a "pocket-book"[1] of useful information for house-owners and house-builders in the department of Sanitary Drainage and Plumbing.

The subject matter is divided into four parts, the first dealing with the general principles of house drainage under the heading of "Recent Progress in House Drainage and Plumbing"; the second, under the heading of "Maxims of Plumbing and House Drainage" discusses in detail the requirements as to material, workmanship and arrangement of sanitary plumbing; the third gives "Suggestions for a Sanitary Code"; and the fourth particularly fills a want long felt in giving a Memorandum of the Cost of Plumbing Work.

In Part I are emphasized the leading points which mark the recent progress in sanitary drainage; the interest taken by the public in these matters and the increased attention given to them by architects and legislators. Sanitary journals have multiplied, sanitary laws been enacted and sanitary inspection enforced; and these factors have resulted, as a whole, in a great improvement in the public health and welfare. In most cases the legal requirements have been wise and salutary and the sanitary periodicals have been conducted generally with a view to the public good; but there are unfortunately many important exceptions to this, which as Mr. Gerhard rightly says "hinder as rapid a progress as might have been expected." There are noted instances where sanitary periodicals have misled the public in matters of vital importance, publishing only one side of questions requiring impartial treatment. This has had the effect of enforcing and retaining in force in some cities, provisions in the laws which are of doubtful utility, and others which are undoubtedly pernicious. In deprecation of such provisions of the law, the *Sanitary Record* of London in a leading article of the May number of this year, fully confirms the views of our author as follows: "When the use of S and P traps under sanitary fittings became general in England, it was soon found that, in practice, the contents of these traps were occasionally siphoned out. . . . Many authorities have asserted that the only protection against this danger is that afforded by ventilation of the traps. Against this practice we must set off the cost and complication of pipes involved, the danger from the evaporation of the contents of the traps, and from frost. A diagram of house-plumbing protected by ventilation pipes as prescribed by most American authorities is a nightmare of complicated ingenuity. The extra cost involved by the ramifications of the trap-vent system is obvious enough, while the danger from evaporation and frost will hardly be contested. . . . We know that in practice the entrance from the trap to the vent-pipe is often found to be partially clogged with grease, hair, etc., and such diminution of its sectional area may seriously lessen its practical value . . . so that in America, at any rate, where self-cleansing antisiphonic traps are to be obtained, it would appear to be rather unwise to continue the use of ventilated S-traps.

Accordingly, in his "Suggestions for a Sanitary Code" Part III, Mr. Gerhard omits the trap-venting-clause and wisely substitutes for it the following: "Every fixture in the house shall be separately and effectually trapped by a seal-retaining trap placed close to the fixture and arranged so as to be safe against back-pressure, self-siphonage, loss of seal by evaporation or siphonage."

This seems to us to be as judicious a wording of the provision as could be found except that, instead of the words "close to the fixture" we should write "as close to the fixture as possible," since in some rare cases it might be desirable to slightly lengthen the pipe between the fixture and its trap as a precaution against back-pressure where other simple means were not convenient.

The same care and good judgment is shown throughout the "Suggestions" as in the clause we have selected as an example, showing that the author has given the subject impartial study from a practical standpoint, and not merely followed blindly a beaten track, or made innovations without sufficient caution or knowledge, as has been too generally the case with plumbing-law makers.

Mr. Gerhard's provisions relating to the sanitary preparation and drainage of building sites and to the damp-proofing and ventilation of floors and walls are excellent, and should be generally introduced into our sanitary codes. His "Rules as to the connection between House-drains and Street-sewers" call attention to subjects much overlooked in our plumbing laws. They are rigid and ample but never superfluous, and their adoption would protect the public without crippling the plumber.

This remark may be applied to Mr. Gerherd's entire chapter of "Suggestions." They should be very carefully studied and adopted by our Boards of Health and Legislators.

The last chapter giving memoranda on "The Cost of Plumbing Work," is very valuable and fills a want long felt.

In short, the entire work is valuable from cover to cover, and should be read not only by every conscientious architect and builder, but by every one who desires to occupy a healthy home.

M. PLANAT'S "*Pratique de la Mécanique appliquée a la Résistance des Matériaux*"[2] is undoubtedly one of the most noteworthy — if not the best — recent contributions to the practical literature of Architecture. Unlike Box's "*Strength of Materials*" or other similar recent works which are apparently written for the engineer only, with little if any thought of the architect, this book is *entirely* devoted to what might be called the engineering of architecture; and there is hardly a problem likely to arise in architectural practice for which a solution could not be found in it.

Of course there are some points that seem to call for criticism, and in making these the writer cannot but feel how much more easy it is to find fault than to do a thing well one's self.

M. Planat explains, in the preface, that he has tried to avoid all useless theory and complicated formulæ, reducing all to graphical tables, or to "*théorèmes les plus simples de la geométrie élémentaire*"; facts which the frequent use of differentials would hardly bear out; and we fear that any student turning to pp. 35, 36, 292, 326, 327, or many similar ones might get discouraged at the appalling array of formulæ presented therein. Then, again, M. Planat apologizes for frequent repetitions, claiming that every chapter thus forms a whole, "making it more valuable for reference," another statement which he fails to carry out. The book would undoubtedly have been much more valuable as a reference-book had he resorted to the tedious but important practice of repeating after each formula the exact meaning of every symbol or letter. As this is not done, the value of the book as a reference-book is almost entirely destroyed. For instance, were the architect to refer to his formula for columns, p. 357, viz:

$$\frac{N}{W} = \frac{7500}{1 + 0{,}00335 \times \frac{l^2}{h^2}}$$

(there being no explanatory key), he would naturally think that the $\frac{l^2}{h^2}$ were the same as in Gordon's formula, or that h stood for the least diameter. By referring back some twenty pages, however, to page 337, he will find that h^2 really takes the place of r^2 in Rankine's formula, and stands for the square of the radius of gyration of the least diameter — quite an important difference.

[1] "*The Sanitary Drainage of Buildings;*" by William Paul Gerhard, C.E. New York: D. Van Nostrand, 1887.

[2] "*Pratique de la Mécanique appliquée á la Résistance des Matériaux.*" Par P. Planat, Directeur de *La Construction Moderne*. Première édition. En vente aux Bureaux de *La Construction Moderne*, Place Boieldieu, 8: Paris, 1887. 935 pages, quarto.

When these minor criticisms are made, however, none but praise remains for this valuable work.

There are chapters on the theory of the "deformation of pieces" in which he reduces all forces to the simple movements of an atom in the three directions, as taught in analytical geometry. Also, chapters on the exterior and interior forces (strains and stresses), tension, torsion, compression; strength of metals, woods, stones, cements, limes and mortars; moments of inertia, transverse strengths, deflections, built-in and laid-on beams, riveted girders, iron and wooden columns, iron and wooden trusses, arched trusses, spires, masonry-centres, retaining-walls, foundations, bearing-walls and arches. From this enumeration the value of the book can easily be judged, particularly when it is remembered that he adds many practical examples and tables. A detailed review of the book would take many pages. A few points, however, may be of interest.

The method of reducing many forces to a single force, as explained in Chapter I, is interesting, but very theoretical.

The next chapter, on tension, is particularly full and interesting. On page 50 is a diagram, showing, in a very clear manner, the action of iron under tension.

The following tables, on pages 51 and 52, show very clearly the amount of elongation from tension in wrought-iron and steel; also, the amount of permanent set of the metal after its reaction, when the strain is removed. He concludes that the strength in resisting tension is not proportioned to the ultimate resistance of the material, but to its limit of elasticity; that is, that certain severe strain after which the metal refuses to react. He places the safe resistance to tension of iron at 12 kilogrammes per millimetre (17000 lbs. per square inch), or in "important works" at 6 kilogrammes (8500 lbs. per square inch) — rather a large difference. In reading this work one cannot but regret anew that we have not yet adopted the metric system, as all foreign works are thus rendered practically useless to us

In the compression of stones, etc., M. Planat allows as safe but $\frac{1}{10}$ of the ultimate resistance to crushing, in ordinary stones; or $\frac{1}{8}$ if the stone is "close-grained, well cut, well laid, and not altered by exposure." In considering the difference between stones laid "on edge" or "on bed," he finds there is no practical difference, if "the stone is homogeneous, with stratifications not easily found"; but even where the layers can be easily traced, he mentions that the difference is not so great as one is "tempted to think" — a statement hardly borne out in practice. Many interesting experiments are quoted to prove that dry stones resist compression better than wet stones; in many cases stones when wet losing from $\frac{1}{4}$ to $\frac{1}{3}$ of their resistance to crushing, and in some cases even $\frac{1}{2}$ — a very important consideration in exposed places, bridge foundations and reservoir walls.

For stones, the strength of which cannot be ascertained by experiment, he suggests that their weight be compared with that of some well-known stone, and the strength proportioned accordingly, the heavier stone being, of course, the stronger.

Similarly for unknown cements, he suggests that all be passed through the same sized sieve; that a measure be then filled with each, by pouring the cement over an inclined plane, but not packing it, the heaviest to be considered the best; the finer the cement-powder the better. The sieve he recommends should have 15 meshes per centimetre, or 38 meshes per inch.

The chapter on transverse strains is very interesting and very complete. It exhibits most curiously how the political animosity existing between two nations can be carried even into the realm of science. M. Planat mentions that in German practice the strength of beams is according to the modulus of rupture, or ultimate breaking strength, whereas French engineers always use the limit of elasticity (taking $\frac{1}{2}$ thereof as safe); he then proceeds to prove how much superior is the French method, and crows accordingly. He has to admit, however, that experiments favor both methods, but accounts for this from the well-known fact that a small load often applied will gradually alter the nature of the material, or, as he puts it: "M. Tresca's experiments prove that where loads are placed on a beam and removed, the loads increasing in amount constantly, that the limit of elasticity becomes constantly greater, till finally it confounds itself with the limit of rupture; the molecular state of the metal transforms itself little by little; . . . *l'éducation du métal se fait.*"

In regard to the law of the fatigue of metals, he gives an interesting table (taken from the German), on page 102. They consider that a load of 41.25 k. per square m.m., or 58700 lbs. per square inch, can be repeated 170000 times before the beam will break; while a load of 33.75 k., or 48000 lbs. per square inch can be repeated 480000 times; one of 30 k., or 42700 lbs. per square inch 1320000 times; one of 27 k., or 38400 lbs. per square inch 403500 times; while a load of 22.50 k., or 32000 lbs. per square inch, can be repeated *ad libitum*, and will never break the beam.

Most ingenious graphical tables are given for ascertaining the moments of inertia of the various sections of I-beams, channels, tees, angles, riveted girders, etc.

By adopting a horizontal force at each end of a beam — the two forces being equal, but in opposite directions, thus counterbalancing each other — his explanation of the graphical method of calculating bending moments and deflections becomes very simple, and easily understood and remembered. The same may be said of the graphical diagrams for the gradual increase of the thickness of flanges in riveted girders.

On page 171 and the following pages, is a very explicit and able explanation of the action of the different strains or tendencies to crush, shear, turn, etc., on the hard-wood keys or wedges of spliced wooden beams.

In treating of flitch-plate girders, M. Planat gives some very peculiar sections. Instead of using a sheet of plate or boiler iron bolted between two wooden beams as we do, the French custom evidently is to take an I-beam, or riveted girder, surrounding it *entirely* with wood fitted or bolted to the beam or girder. In calculating the strength of such a structure he warns the practitioner not to apportion to the wood and iron separately their respective strengths, but to calculate only for corresponding *deflections* in all parts.

Levers and the varying strengths of beams with built-in and laid-on ends are explained, and very clear graphical solutions given. The examples of levers — and, in fact, all examples throughout — are practical, and such as are likely to be met with in every-day practice. For instance, under levers he gives very fully the calculation of the strength of corbels, columns, consoles, lintels, etc., of an "*Erker*," a species of open stone bay or covered balcony.

The chapter on columns is interesting, but rather complicated and tedious, with the exception of his explanation of the reason why rounded end columns are weaker than columns with planed ends; this is remarkably well done. He enumerates the different formulæ of Hodginson, Love, Gordon and Rankine, preferring the latter to all the others, and proving that it agrees closest with experiments. He then devotes much time to develop a theory of his own, which, after all, proves to be but a very slight modification of Rankine's formula.

The French practice in regard to the minimum thickness of cast-iron columns he gives as follows:

Columns	2 m.	long,	to be	0,010 m. thick.
"	3 "	"	"	0,012 "
"	4 "	"	"	0,015 "
"	6 "	"	"	0,020 "
"	8 "	"	"	0,025 "

or say:

Columns	6′	6″	long, should be	1″	thick.
"	9′	10″	" "	1½″	"
"	13′	1″	" "	2″	"
"	19′	8″	" "	3″	"
"	26′	2″	" "	4″	"

The table for loads to be assumed on floors is rather curious:

Bedrooms	250	K.	per	sq.	m. or	51	lbs. per sq. ft.
Parlors	350	"	"	"	"	71	" "
Grand Parlors	450	"	"	"	"	92	" "
Offices	350	"	"	"	"	71	" "
Assembly rooms	500	"	"	"	"	102	" "
Salons for grand reunions	600	"	"	"	"	123	" "
Cumbersome, but not very heavy merchandise	500	"	"	"	"	102	" "
Docks, depots, and heavy merchandise	1000	"	"	"	"	205	" "

Then follow chapters on trussed beams and girders, wood and iron trusses, riveting, derricks, spires, arched trusses, and wind-pressure, all, of course, well written, but not particularly original in matter of treatment. A very interesting chapter, however, gives the treatment of wooden centres for masonry; also the one referring to the varying strains on tie-rods, in large trusses, due to the effects of temperature, etc.

In the chapter on foundations M. Planat develops some very curious — rather than practical — theories on the compression, and tendencies to shearing, upwards sliding, etc., in compressible soils.

He makes an attempt in the final chapters to treat of masonry, and particularly the thickness of walls, but there are no new rules developed, nothing but the old French rule-of-thumb methods. It is curious that, considering their importance, so little has been done towards ascertaining some exact methods of obtaining the bearing strength of walls and their resistance to bulging. M. Planat develops some curious ideas on this subject: according to his book, off-sets are unknown to him, and all walls must be gradually battered where it is necessary to diminish their thickness. He analyzes three different sections of wall, each of equal amount of material in cross section; the first with both faces vertical; the second with one face slightly battered, and the third with one face very decidedly battered. He finds the last the strongest, but thinks the expense of the ground occupied more than off-sets its value. The second he thinks stronger than the first, but that the expense of battering would off-set the amount of the material saved. On the whole, he inclines to the first method of keeping the same thickness and amount of material in a wall from top to bottom. He next shows graphically the bad effects on a wall of building beam-ends in solidly. The last chapter is on arches and vaults, embodying the usual rules.

In conclusion, if the writer were to be asked by any student how he could best acquire a good knowledge of strains, he could recommend no better course — providing, of course, that the student could read French — than to set to work and carefully translate M. Planat's book.

Telephone Wires. — Telephone wires in Germany are generally made of steel, being considered more durable when of this material. This supposition was fully confirmed after a recent snowstorm, as steel wires were found to have scarcely suffered any injury. The results of the investigations of the general authorities on the matters of the telephone wires, occasioned by the same snowstorm, have just been published. It is found that phosphor-bronze wires are of but little worth; steel showed very favorable results, but those of silicium bronze were proved to be very far the best in every way. — *Invention.*

COMMUNICATIONS.

ARCHITECTS RESPONSIBLE FOR COMPETITIONS.

JOLIET, ILL., June 21, 1887.

TO THE EDITORS OF THE AMERICAN ARCHITECT:—

Dear Sirs.—The following is an advertisement lately received, from which can readily be seen what our Western people have been educated up to. They go by the old adage "Ask and ye shall receive," and they, no doubt, will receive many plans from men who do not value their time or talent. It is not the fault of those who ask and expect a score of architects to submit an aggregate of $10,000 worth of work and information, that they may feed upon the same and finally use their reserved right and reject all plans, after having their chosen political architect or some one else make tracings of the best feature of each and combine them in one.

The fault lies with our own profession; if a few such invitations would go totally unheeded by the architects it would not be long before the public would learn that to obtain good talent in competition they must give some substantial assurance that at least some two or three of the competitors are going to be paid for their trouble, even though all plans be rejected. They would soon adopt the prize-system, and would undoubtedly receive in competition the thought and knowledge of the best of architects, which would, no doubt, be much better for them as well as ourselves. This seems to be a sort of missionary work that should be taken up by our societies and something done to prevent it; good public buildings should be well designed and well built, as they will reflect credit or discredit on the architects of this age for centuries to come. The remedy may come in a higher education of the masses, but I think more quickly and more substantially in a higher education of our own men. Architects should be educated up to a standard where they would consider it a disgrace to go into such a competition, and until then it is doubtful if the end can be reached; however, I would be glad to hear from other members of the profession on this point.

Very respectfully yours, F. S. ALLEN.

[THE advertisement referred to calls for plans, specifications and estimates for a $170,000 Court-house, and "reserves the right to reject any and all plans," and, moreover, states that "no compensation will be paid for any plans except those adopted by the commissioners."—EDS. AMERICAN ARCHITECT.]

A WIND-SHAKEN HOUSE.

TO THE EDITORS OF THE AMERICAN ARCHITECT:—

Dear Sirs.—Will you be good enough to furnish an occasional reader with some information on the following points: Is a dwelling-house, of brick—walls thirteen inches all the way up, two full stories with third story in steep pitched gable—that shakes or thuds occasionally in a very violent wind, to be considered safe? The house is cruciform in shape, with four wings, averaging each eighteen feet in width; situated on top of a hill in an exposed situation; otherwise a well-built house, joints between bricks well slushed with mortar, and floor-joists throughout twelve inches. It is more of a concussion than a shaking, in a very high wind. In general, is a house stoutly built that is at all jarred in a very high wind? The occupants of some very large houses, situated, however, in an exposed place, complain of the same thing. Your opinion in the matter will be gratefully received.

[IT does not seem as if a house of the shape described would be in danger from ordinary high winds. A perceptible shaking would not necessarily be a serious matter, unless it should be followed by the opening of joints in the brickwork.—EDS. AMERICAN ARCHITECT.]

INFORMATION WANTED.

TO THE EDITORS OF THE AMERICAN ARCHITECT:—

Dear Sirs.—Can you kindly tell me in what number of the *Saturday Review* I may find the article spoken of in an editorial on "The next Examination for the Rotch Travelling-Scholarship," printed in No. 587, April 2, of the *American Architect*. The article I want to find in the *Saturday Review* is the one speaking of the recent exhibition of water-colors in London by Mr. Mead. I have looked over all the *Reviews* since January 1, 1887, and cannot find it, so trust you can help me.

Yours truly, M. C.

[WE got our information about the article in the *Saturday Review* at second-hand. Perhaps one of our readers can give the reference.—EDS. AMERICAN ARCHITECT.]

AMFRICAN ARCHITECTURAL SCHOOLS.

RACINE, WIS., June 20, 1887.

TO THE EDITORS OF THE AMERICAN ARCHITECT:—

Dear Sirs,—Will you kindly publish names of some of the best architectural schools, with name of proper persons to address for information in each case? Yours truly, E. H. PRICE.

[MASSACHUSETTS INSTITUTE OF TECHNOLOGY, Boston, Prof. T. M. Clark, 178 Devonshire Street, Boston; Columbia College School of Mines, New York, Prof. W. R Ware; Cornell University, Ithaca, New York, Mr. E. F. Osborne; Illinois Industrial University, Champaign, Ill., Prof. N. C. Ricker, Urbana, Ill.—EDS. AMERICAN ARCHITECT.]

PITTSBURGH, June 15, 1887.

TO THE EDITORS OF THE AMERICAN ARCHITECT:—

Dear Sirs,—Can you give me an idea of the total cost of a two years' special course in architecture at the Massachusetts Institute of Technology. Please answer through your journal, and oblige

ARCHITECTURAL STUDENT.

[Two hundred dollars a year for tuition; books and materials twenty or thirty dollars a year; board and personal expense from four hundred dollars a year upward.—EDS. AMERICAN ARCHITECT.]

NOTES AND CLIPPINGS.

RATS BREAK UP A MINING STRIKE.—It is during a strike in the mines, when the workings are abandoned for the time, that the mine rats are especially annoying to mining villages. The rats leave the mines then and swarm about the dwellings of the workmen. I remember once there was a strike at one of the collieries. Both operators and miners refused to give in, and the bosses declared that grass would grow around the mouth of the slope before they would consent to the demands of the men, while the men swore that they would cut the grass and eat it, if it was necessary, before they would yield a single point. The mules were taken from the mines and turned out to pasture. The rats, being thus deprived of their sustenance, abandoned the mine and took up their quarters about the miners' houses, where they became a terror to the families. The strike continued, and the supplies of the men became exhausted. Miners at neighboring collieries who were at work responded to the requests of their striking brethren for aid, and sent them a wagon-load of supplies of various kinds. These were taken in charge by a committee and stored in a building, from which they were to be distributed to the neediest of the miners. The first night the store was raided by the rats, and everything devoured or carried away. Four different loads of supplies were furnished in this way, but the rats got the biggest share of them. A good many of the miners kept cows at that time, there being plenty of free pasturage about the place, but soon after the strike began the cows began to lessen their yield of milk. This could not be understood, until one morning a miner went to his barnyard and discovered half a dozen big rats sucking the milk from his cow as she lay on the ground. These combinations against them at last forced the strikers to weaken, and they finally went to work on such terms as they could obtain, absolutely beaten by the devouring horde of rats.—*New York Sun.*

WATER-RAMS IN STEAM-PIPES.—Mr. Charles E. Emery, chief engineer of the New York Steam Company, in one of his recent lectures on "The Transmission of Steam," refers in an interesting manner to water-rams in steam-pipes. In the April number of the *Stevens Indicator* Mr. Emery is quoted as follows:

The principal cause of accidents in the operation of large, long steam-pipes arises from the presence of water. If steam be admitted at the top of a vessel partially filled with cold water, condensation will take place until the surface is somewhat heated, and this, in connection with a cloud which forms above the surface, will retard rapid condensation, so that, in due time, the full steam pressure can be maintained above water cold at the bottom. This phenomenon is not an infrequent occurrence in boilers in which the circulation is defective. It is, therefore, perfectly safe to heat up any vessel containing cold water, if the steam can be admitted from the top upon the surface of the water and so maintained. If, however, steam be blown in below the surface of the water, a bubble will be formed, which will increase in size until its surface becomes sufficiently extended to condense the steam more readily than it can enter, when a partial vacuum will be created, the bubble will collapse, and the water flowing in from all sides at high velocity will meet with a blow, forming what is called a water-ram. In blowing into a large vessel, these explosions occur in the middle of the mass, and create simply a series of sharp noises. If, however, steam be blown into a large inclined pipe full of water, it will rise by difference of gravity to the top of the pipe, forming a bubble as previously stated; and when condensation takes place, the water below the bubble will rush up to fill the vacuum, giving a blow directly against the side of the pipe. As the water still further recedes, the bubble will get larger, and move further and further up the pipe, the blow each time increasing in intensity, for the reason that the steam has passed a larger mass of water, which is forced forward by the incoming steam to fill the vacuum.

FIRES IN PARIS.—The returns showing the number of fires which occurred in Paris during the year 1886 have just been published, and the total was 953, this being exclusive of 1,524 chimneys on fire. This is a larger total than has been recorded for several years, and among the calls for fire there were no fewer than 13 in theatres and cafés-chantants, these being the Vaudeville, the Opéra Comique, the Hippodrome, the Odéon, the Porte St. Martin, the Eden Theatre (twice), the Opéra (twice), the Château d'Eau, the Théâtre de Paris, the Padro and the Bataclan. The three months during which there were the most fires were January, November, and December. The total amount of damage done by the 953 fires is estimated at about £248,000, and in 842 cases the loss to property was covered by insurance, but the furniture was insured in only 640 cases. In 407 cases the fire was extinguished without having recourse to the engines, and in many of the other cases they were not wanted when they reached the scene of the fire. No fewer than 107 of the fires were caused by the upsetting of lamps, while only 10 are attributed to incendiaries. No lives were lost during the year, either among the inhabitants of the houses where the fires occurred or among the fire-brigade, which at present consists of

1,754 men, including 51 officers, who are quartered in 11 different barracks, a twelfth being now in course of construction. Each barrack is provided with a hand-engine and two pumps, carrying about 650 feet of hose and an escape-ladder, a ventilator to be used when the fire breaks out in a place full of noxious gases, and safety-lamps of various patterns. There are also 11 steam-engine depots in Paris and 85 lookout-posts, of which 62, each with two, three, or four men, are in the theatres. The length of the telegraph-wires connecting the different stations is about 350 miles. — *London Times.*

Death by Electricity. — A number of interesting experiments have just been made with such electrical machines as are employed in industries, with the view of determining under what conditions they may become dangerous. These have been conducted by M. D'Arsonval, who has already established the fact that what is truly dangerous where these machines are used is the extra current that occurs at the moment the current is broken, and in order to annul this extra current he proposes to interpose a series of volta-meters containing acidulated water along the conducting wire. The new arrangement now employed is at once more simple and efficient. It consists of a V-shaped tube made of an insulating substance, which, after being filled with mercury, is interposed in the main current. In order to close the latter it is only necessary to turn a tap, which is arranged similarly to the tap on the gas-pipe. In this way the machine is unprimed without its being able to give an extra current spark. Another arrangement is also made use of, a glass tube being filled with mercury and dipped into a reservoir containing the same substance. The tube is provided with a ground stopper, this not only permitting the suppression of the extra current but also interposing any sort of resistance to the current. Although these details appear rather technical, they relate to a most important matter. The use of electrical machines is increasing, and it is of practical use to know that currents are not dangerous until a power of 500 volts is reached. It is also of interest to know that the mechanism of death varies with the nature of the electricity used. Thus, with the extra current, or with alternating currents, there is no anatomical lesion, and the patient can usually be brought back to life through the practice of artificial respiration, as employed in cases of drowning. The discharge of static electricity from batteries, on the contrary, causes a disorganization of the tissues that renders fruitless all attempts to restore life. — *London Times.*

Portland Cement and Sea-Water. — An important point as to the behavior of Portland cement when subjected to the action of seawater has arisen at Aberdeen, where the Harbor Board recently requested Professor Brazier, of Aberdeen University, to analyze samples of briquettes of the Portland cement used in the construction of the graving-dock, and also samples of the concrete taken from the entrance-walls of the dock. Professor Brazier's report was received on Monday, and states that a chemical action had taken place between the seawater and the Portland cement in the concrete, causing an expansion and softening of the concrete, the lime of the cement becoming dissolved and producing a precipitation of magnesia, and the lime becoming more or less carbonated. It would appear, the Professor states, that Portland cement has not sufficient power to resist the action of seawater. The harbor engineer also reported that the Portland cement concrete entrance-walls of the dock had expanded 2½ inches in the height of the walls, their surfaces had cracked and bulged, and the joints of the caisson quoin-stones had opened up, causing considerable leakage. Repairs were suggested by the engineer at an estimated cost of £900. The reports are to be considered in committee. — *Building News.*

Illuminating Streets by "Smoke." — When William Murdoch made his discovery of combustible air, or gas, even great and wise men laughed at the idea. "How could there be light without a wick?" said a member of Parliament, when the subject was brought before the House. Sir Humphry Davy ridiculed the idea of lighting the town with gas, and asked one of the proprietors if he meant to take the dome of St. Paul's for a gas meter. Sir Walter Scott made himself very merry over illuminating London "by smoke," though he was glad enough, not long afterwards, to make his own house at Abbotsford light and cheerful on wintry nights by the use of that very smoke. When the House of Commons was lighted by gas the architect imagined that the gas ran on fire through the pipes, and therefore insisted on their being placed several inches from the wall for fear of the building taking fire. The members might be observed carefully touching the pipes with their gloved hands, and wondering why they did not feel warm. The first shop lighted in London by this new method was Mr. Ackerman's, in the Strand, 1840; and one lady of rank was so delighted with the brilliancy of the gas lamp on the counter that she asked to be allowed to take it home in her carriage. — *Invention.*

Ancient Chinese Bas-Reliefs. — An English traveller, who has been inspecting certain ancient bas-reliefs near Chia-siang, China, in a chapel built in the second century and lately freed from the accumulated earth of ages, reports that the aim of the Chinese sculptors was largely to inculcate morality. Thus a wife who allowed an enemy to cut her head off, supposing it to be that of her husband, is depicted. Another purpose was "to picture the wild and incredible in nature, and certainly the view here given of the monstrous beings which the people of China then thought of as existing in earth, air and seas is confirmed by the books which remain from that age. Another prevailing aim was to bring good fortune to the descendants of those buried in the tombs by depicting lucky plants, lucky clouds, lucky animals, and favorably-disposed divinities." These sculptures are supposed to be the same that are described in the antiquarian book written in Chinese, and belong to the epoch 400 B. C.–200 A. D., when bas-reliefs of the kind flourished. In front of the chapel are pillars carved with grotesque door-keepers in the shape of eight-headed human tigers, three-bodied human monsters, and other figures designed to keep off evil spirits.

Coke for Vault-Filling. — The use by old Roman architects of volcanic scoriæ or pumice as a filling-material for vaults and spandrels is a practice that might be profitably copied in our own day. The vaulting of the corridors of the amphitheatre at Catania is so executed, and so is the dome of the Pantheon at Rome. These structures have stood the sieges, earthquakes, and various other causes of damage and decay for many centuries. Coke is a somewhat similar material, and might be used as a substitute for the often rare pumice. — *Engineering News.*

A Statue of Salmon P. Chase. — There lies in a store not far from Charles Street a valuable historical relic, which would gladden many admirers of the late Chief Justice Chase did they possess it. It is a statue, heroic size, with pedestal, of the late Salmon P. Chase, designed by Clark Mills, the sculptor, who contracted to furnish the government with seven statues, made from captured cannon, and of these this is one. Had the statue been polished, the death of the sculptor, which occurred shortly after its completion, would not have acted as a bar to its delivery to the government. In the course of a business transaction this valuable work of art found its way to its present quarters, where it is secluded from public observation. — *Baltimore American.*

TRADE SURVEYS

Both American and foreign markets are firm in tone under a steady expansion of trade. The signs in commercial and financial circles are briefly these: Light stocks, steady demand, large orders, sufficient money, confidence and a moderate indebtedness on the part of the producing interests. The main industrial features this week are, a steady distribution on old orders, increasing new orders, numerous inquiries, favorable returns from large consumers, and exhausted condition of stocks among buyers. Whether we look at consumers of cotton, wool, iron or lumber, or at the uses of such manufactured products as cloth, furniture, hardware or machinery, it is evident that the users are scantily supplied rather than abundantly. From the forthcoming distribution of trade catalogues it will be shown that the shop and mill-producing capacity of the country has been greatly extended within six months in view of what all confidently believe will be the best season the country has ever had. The enlargement of lumber markets in a half dozen States of the Northwest has made prices in Michigan firm. Within a few days an advancing tendency has been noted which Eastern dealers and builders would do well to notice. A sort of combination is being attempted in white pine, and the first step is to stop a useless cutting of prices that has been going on. It may sound strange in view of the enormous lumber cut in the East, Northwest and South, to intimate that higher prices are probable or even possible, but let a few facts and conditions be kept in mind. Rates have been advanced by rail and lake — vessels, for some reason, are not plenty enough to keep prices down. The far West is absorbing an enormous amount. Dealers West are beginning to order ahead, just as Eastern dealers did last spring. Lumber manufacturers are holding their heads together better. Drystuff of all kinds is scarce. Every cargo and car-lot of lumber has thus far found a ready market and stocks in first and second hands are merely nominal. Recent lumber contracts at New York call for some 35,000,000 feet of stuff, of which one is for 5,000,000 feet of hemlock for the Poughkeepsie bridge, 2,000,000 for the Harlem bridge, 2,000,000 for Arthur Kill bridge, 15,000,000 feet for aqueduct work, 5,000,000 feet for elevator work, besides other orders. The export trade in lumber is quite an item, and is helping to strengthen prices. Last week 31 clearances were made from New York of 1,855,657 feet of lumber and 131,000 shingles for the West Indies and South America. Other minor facts and considerations might be adduced to show buyers of lumber that it is advisable to keep one eye on the lumber market. In other directions there is much that is interesting to note. The Western iron association, representing 150 rolling-mills, quietly conceded the ten per cent advance asked, and are repairing their hot furnaces to rush into the fall trade. The importation of over a half million tons of foreign iron and steel shows that, as yet, we have not exceeded the safe-producing limit, and even our ore mines are unequal to the demands made upon them, for the ore importations are over a half million tons, although special causes are behind this fact. Then, again, there are inquiries in for large lots of foreign steel rails, and one order for 10,000 tons, which was taken for Gulf delivery at $40.50. Buyers are taking the initiative in all channels of trade, and this is the most encouraging fact of all. Sellers are anticipating an improvement in prices, and are therefore not crowding after business, being content to take what comes, and nurse their opportunity. The favorable crop reports and the prospects for strong prices are strengthening the position of tool, implement, stove, and machinery makers both West and East. Within two weeks it is probable that raw material of nearly all kinds will be in demand for the autumn months. The New England textile manufacturers, paper-makers, boot and shoe makers, and other large interests have evidence before them already of the healthy character of the fall trade. Pessimists are driven on account of the scarcity of material to make capital out of the growing treasury surplus, and to predict damaging consequences on account of these accumulations. The first damage done will be by the action of the money-lending interests when pay-days for money loaned passes. The extraordinary investments in the South and the great outlay in the Western States make danger in this direction probable, but if it comes the change will be merely in the title to the property. The improvements will remain.

Building activity will not slacken. A new shower of permits is probable. Architects in Chicago, St. Louis, and Cincinnati speak very encouragingly of the prospects of building, and reiterate previously-expressed opinions as to the permanent value of investments. Commercial failures are few and the amounts comparatively trifling. Collections are easily made. Merchants and manufacturers have but few bad debts, and banks are called on less frequently than in former years to help out unfortunate customers. The situation at this date is such as the most exacting merchant cannot help but feel is safe. The thousands of new firms, companies and corporations who are entering production and exchange on the high tide of prosperity have only to remember that there are as many breakers ahead in 1887 for the next five years as there were in 1882, and since then 50,000 commercial houses have gone under. The newer competitors for trade and business are wisely guarding against disaster by making stronger combinations, by using heavier machinery, and by adopting a multitude of little economies in the conducting of business which are not ordinarily within the reach of men or concerns of limited means.